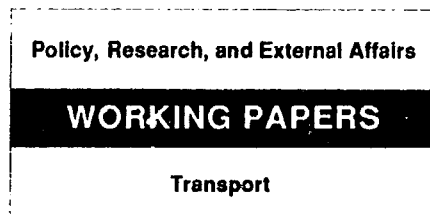


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Reducing Labor Redundancy in State-Owned Enterprises

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The severity of labor redundancy has been underestimated because of difficulties in conceptualizing the issue and finding politically acceptable solutions. Schemes to reduce labor redundancy can decrease the wage bill significantly and allow fairly high compensation to the employees laid off yet still allow the government to recoup its costs in a relatively short time.

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The growing effort to reduce large public deficits and to increase welfare by improving the efficiency of resource allocation is leading many governments to concentrate on the problem of sizable, costly labor redundancy in the public sector. The existence of such redundancy has been acknowledged but its severity has been underestimated. And its effect on the budget is significant, as the wage bill is usually the largest component of the public budget.

Svejnar and Terrell focus on what determines labor redundancy in selected modes of transport (rails, ports, and buses) in six countries: Brazil, Chile, Ghana, Mauritius, Sri Lanka, and Yugoslavia. They also analyze different approaches for solving the problem.

They conclude that analysis of the labor redundancy problem in public transportation enterprises has been neglected because conceptually it is not a simple, easily identifiable phenomenon and because its treatment is often politically controversial, as it affects social welfare. Governments tend to approach the problem only when circumstances are extreme (budget stress or near-complete breakdown of the transport system). Solutions are then hammered out in a tense environment, with no longer-term vision of the optimal employment and pay practices.

The first step in designing a scheme to reduce redundancy is to be clear about what the optimal pay and employment policies are in a given system and environment. Svejnar and Terrell discuss some of these policies and the tradeoffs involved.

They also present a framework for identifying labor redundancy within different countries whose social welfare functions vary in the relative weight given to efficiency and equity. They give a rule of thumb for identifying labor redundancy where the government's main goal is maximizing GN¹. They show that the private and social assessments of labor redundancy can differ substantially and that the private assessment is not always the appropriate measure.

They show that redundancy-reduction schemes can have a high rate of return and still be socially acceptable. Long-term savings on the wage bill can be high enough that compensation to employees laid off can be set fairly high and still allow the government to recoup its costs in a relatively short time.

But cash flow problems may necessitate the assistance of international donor agencies. Attention must be paid to how this compensation is administered, as it can make a difference to the workers' welfare.

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LABOR REDUNDANCY IN STATE OWNED TRANSPORTATION ENTERPRISES: DETERMINANTS AND SOLUTIONS

The growing effort to reduce large public budget deficits and to increase welfare by improving the efficiency of resource allocation is leading many governments to concentrate on the problem of sizable and costly labor redundancy in the public sector. Although the existence of some public sector redundancy has been generally acknowledged, the severity of the problem has been widely underestimated. A closer examination of the situation suggests that in many countries over 20% of the public sector labor force is deemed redundant and that in some countries the percentage is considerably higher. Since the wage bill is usually the largest component of the public sector budget, the effect of labor redundancy on the budget, efficiency and welfare can be substantial.

Our study has been motivated by the fact that there has been little systematic analysis of the problem and of the substantive and diverse efforts of countries to cope with it. The study focuses on the determinants and solutions to labor redundancy in selected modes of transport (rails, ports, and buses) operated by the public sector. The focus on the state-owned transport enterprises, as opposed to the public sector at large, stems from both the perceived severity of the labor redundancy problem and the availability of precise performance measures in this subsector.¹

The analysis is based primarily on case studies of six countries (Brazil, Chile, Ghana, Mauritius, Sri Lanka, and Yugoslavia), which at various points in time accumulated significant amounts of redundant labor and adopted a variety of approaches to solve the problem. This study summarizes and draws conclusions from the detailed comparative analysis of these countries.² However, information from a number of other contexts is also used in order to further exemplify various findings.

The study is divided into four parts. In the first part we outline a conceptual framework for analyzing the extent of labor redundancy and designing policy solutions. This part is motivated by the fact that the concept of labor redundancy is frequently not clearly understood and that policies often lack solid conceptual grounding. In Part 2, we provide a practical background to the problem by identifying the principal causes of labor redundancy, factors preventing an adjustment in employment or wages and factors that lead to decisions to reduce excess labor. In Part 3 we discuss the methods that are usually employed to identify redundancy, the findings on the extent of redundancy and the resulting policies and redundancy schemes. Part 4 contains evaluation and lessons for future policy work in this area.

¹The labor redundancy problem is arguably equally severe in the civil service, but the ability to measure productivity and hence estimate the nature and extent of labor redundancy in this subsector is extremely limited.

²The six individual country studies are presented in the following separate volumes: Svejnar and Terrell (1991a,b), Svejnar and Tutu (1991), Svejnar and Skreb (1991), and Terrell (1991a,b).

1. A CONCEPTUAL FRAMEWORK FOR IDENTIFYING AND TREATING LABOR REDUNDANCY

In dealing with labor redundancy in state-owned enterprises (SOEs), policy makers need to consider two important questions:

- (a) what are the **optimal employment and pay policies** that minimize the emergence of redundant labor while promoting efficiency and social welfare, and
- (b) how to assess causes and extent of labor redundancy and design **optimal schemes to reduce redundant labor** in situations where redundancy has arisen and needs to be dealt with.

The identification of optimal employment and pay policies is important because they determine how the SOEs would operate in a steady state without labor redundancy or other major inefficiencies. These policies should therefore result in practices that are both consistent with the maximization of social welfare at the national level and elicit efficient management of the SOE. Hence, the identification of the optimal steady state employment and pay policies is also a prerequisite for the determination of the causes and extent of labor redundancy and a successful design of schemes aimed at reducing labor redundancy when it becomes a problem. They serve as a target to which the scheme should provide an optimal trajectory.

A conceptually useful approach to the problem starts from the premise that employment and pay policies as well as labor redundancy schemes should be consistent with the maximization of the society's objectives. How this task is accomplished in turn depends on the country's socio-economic system and environment. The system is usually defined as the endogenously determined set of laws, institutions, organizational structures, and accepted practices, while the environment reflects the given level of technology, prices and resource endowments. The optimal employment and pay policies and redundancy schemes thus depend on the social welfare preferences and the existing system and environment. As we show below, in some cases (e.g. until recently Brazil and Yugoslavia) the social preferences, as reflected in the overall government policies as well as the legal and institutional framework (system), were accepted as immutable. Other cases (e.g. those of Chile, recently Brazil and to a lesser extent Ghana) exemplify situations where the incoming governments had significantly different social and economic philosophies than their predecessors, imposed different social preferences, and changed the main systemic features (laws, institutions and practices).

In the next section, we examine the theoretical aspects of optimal employment and pay policies. This is followed with a discussion of the implications of the theoretical principles for the design and implementation of optimal redundancy schemes.

1.1 Theoretical Aspects of Optimal Employment and Pay Policies

As we indicated above, the optimality of any given set of policies depends on the social preferences and the principal systemic features. In the labor area, the spectrum of relevant social preferences, laws and institutions spans a wide range. On the one extreme is a free market system where the employment and pay practices are determined solely by the employers and employees. This system is characterized by little (to no) protective labor legislation or unions. At the other extreme one finds a highly socially oriented system with considerable government intervention (e.g. legally

guaranteed job security), but also government imposed limits on the existence of restrictive work practices. Among our studies, Chile under Pinochet represents an example of the former and pre-1990 Yugoslavia of the latter case. Between the two extremes lie various cases, with their salient features being the presence of economically (rather than politically) oriented trade unions, collective bargaining and restrictive work practices. The two extremes are very different philosophically, but they are surprisingly similar in their avoidance of restrictive work practices. The intermediate cases frequently lack the legal guarantees of job security, but the presence of unions and collective bargaining usually leads to the instituting of contractual provisions in this area.

Since labor redundancy implies that the labor force of an enterprise is excessive relative to some optimal employment level, we next outline the criteria for determining optimal employment in different systemic and environmental settings. We note that in some cases there is no difference between the optimal employment policies of state and privately owned enterprises. In other circumstances the difference may be substantial.

We start with the case of a nonunion firm operating in a free market setting. The benchmark form of employment and pay practices in this setting is the **spot market**, a concept that reflects the traditional textbook example of a highly flexible market in which employment and wages adjust instantly in response to changes in the relevant exogenous factors. At the level of a given firm, the employer freely adjusts employment so as to equate labor's marginal product R to the market clearing competitive wage W_c ($R = W_c$). Apart from providing an important yardstick for evaluating different labor market practices, the spot labor market has numerous real world manifestations. Spot market type practices are frequently observed in circumstances where specific human capital is unimportant and effort is easily monitored (e.g. casual port workers). High labor turnover does not have a negative effect on production and the reliance on temporary contracts based on spot market wages is the optimal strategy for the employer. Workers are paid competitive wages and the lack of job security and unimportance of firm-specific human capital means that labor redundancy either does not arise or, if it does, it is not a lasting phenomenon.

If worker effort is important but not easily observable, optimal employment practices are often believed to reflect the so called **efficiency wage** principle. In this setting the employer can again freely adjust employment but finds it profitable to pay above market wages ($W > W_c$) in order to elicit greater worker effort (prevent shirking). Greater effort is forthcoming because the worker fears the loss of the wage premium if his performance were deemed inadequate and his employment (wage premium) terminated.³ For our purposes, the efficiency wage system differs from the spot market only in that the wage is set by the employer above the market clearing level and the optimality criterion for employment -- the equality between labor's marginal product and wage ($R = W > W_c$) -- refers to values per efficiency unit of labor. The employer determines the policy and there is no reason for labor redundancy to arise or last. Note, however, that if the employer were suddenly not allowed to lay off workers or lower the above-market wages, these high wages might not bring about greater effort and redundancy might occur. From a policy standpoint it must be stressed that the efficiency wage behavior of firms, while appealing conceptually, is difficult to identify empirically. Hence, while the phenomenon may be important, it has proved difficult to distinguish it conclusively from other types of labor market behavior on the basis of observable variables.⁴

³See e.g. Akerlof and Yellen (1986) for examples of theoretical studies in this area.

⁴See Krueger and Summers (1988) for an example of an empirical investigation.

Another case when a deviation from the $R = W_c$ rule is optimal in the free market, nonunionized setting is when firm-specific human capital is important or when the cost of labor adjustment (i.e. the cost of recruiting, screening, firing, etc.) is significant. In these circumstances the firm may prefer temporarily to retain employees whose marginal product becomes low (e.g. on the downturn of the business cycle) in order to minimize the cost of labor adjustment.⁵ The "decasualization" of the port workers in modern ports is a good example of the growing importance of specific human capital in this transport mode and the corresponding desire of the employers to keep a highly trained labor force.⁶ For the purposes of this study, the most important feature of this case is the fact that the temporary hoarding of low productivity labor is a profit maximizing (optimal) phenomenon. However, from the policy standpoint it may be useful to distinguish whether the cost of labor adjustment is the natural outcome of the functioning of the market (e.g. the cost of screening applicants) or the result of government regulation (e.g. legally mandated severance pay). In the former case labor hoarding is an optimal policy of the firm and does not constitute an inefficient accumulation of redundant labor. In the latter case the excess labor is inefficient from the profit maximizing standpoint of the firm but, depending on the social welfare preferences, it may or may not be efficient from the society's perspective. Moreover, in the latter case a change in the system (laws and regulations) could easily eliminate the phenomenon.

A third optimal deviation from the $R = W_c$ rule may take place if workers are more risk averse than firms. In this case it is optimal from the joint standpoint of the workers and firms to agree (perhaps implicitly) on contracts that stabilize employment and wages in the face of fluctuations in exogenous variables. The firms gain by being able to pay lower average wages than they would have to pay otherwise to attract the workers. The risk averse workers are better off because they value stability and are willing to trade off (uncertain) wages and employment for stability.⁷ This optimal long term relationship may of course have a short term manifestation of $R < W_c$. However, since both workers and firms prefer this framework, the temporary hoarding of low productivity labor is again not a sign of labor redundancy. In the context of SOEs, the interesting implication of the implicit contract model is the fact that SOEs, being government organizations, are arguably completely risk neutral or at least less risk averse than private firms. Since the optimal degree of stabilization of employment and wages rises with the difference in risk aversion between the worker and the firm, the SOEs should optimally exhibit a greater extent of employment and wage stability than otherwise similar private firms. In this case it would be optimal for an SOE to operate with higher employment and lower wages than an otherwise identical private firm.

The important social welfare implication of competitive labor markets is that, while not always equalizing the marginal product of labor and the wage, they tend to give rise to privately Pareto efficient outcomes in a generally competitive economy. However, these outcomes may or may not be viewed as optimal from the social welfare standpoint. In particular, the outcomes may for instance be viewed as producing a socially unacceptable income distribution. There may then be arguments for government intervention or the legal sanctioning of certain countervailing forces such as unionization. Most countries have indeed accepted the idea that "labor is not an article of commerce" and permitted unionization as part of the economic system.

⁵The firm would also not hire a large number of workers on the upturn. See e.g. Nickell (1986) for a review of this case.

⁶See e.g. Harding (1990).

⁷See, for instance, Azariadis (1979) for a survey of the implicit contracts literature.

The opportunity to form a union gives workers the power to bargain collectively. Collective bargaining in turn introduces worker preferences explicitly into the decision making framework at the firm level. Hence, while in the earlier cases the employer unilaterally set employment and pay (thus avoiding labor redundancy),⁸ in the unionized setting the employment-wage outcome is the result of strategic interaction between the employer and the union. If unionization is a socially acceptable economic activity, the resulting pay-employment practices are in a broad sense (tautologically) optimal from the social standpoint.

Inefficiency would arise, however, if collective bargaining gave rise to firm-specific outcomes that were inconsistent with the pursuit of an overall social objective. This inefficiency would be similar in nature to those arising in nonunion settings in the presence of imperfect markets. In what follows we discuss this possibility when the principal social goal is the maximization of GNP.⁹

Analogously to our earlier treatment, let W_c be the market clearing (shadow) wage of a given (efficiency) unit of labor of a given skill in the economy. The objective of maximizing GNP suggests that labor ought to be allocated across different uses so as to ensure the equality of the marginal product of this unit of labor with W_c everywhere (point A in Figure 1). Departures from this rule in practice constitute departures from optimality because GNP could be increased by moving labor from less to more productive activities.

Unionization may result in a variety of outcomes depicted in Figure 1. The figure captures labor market outcomes in terms of the marginal revenue product curve of labor R (the short-run demand curve for labor) and the iso-profit curves giving the wage-employment combinations that yield identical levels of profit to the firm. From the conceptual standpoint the important iso-profit curves are the zero iso-profit curve $\pi = 0$, corresponding to the minimum acceptable profit, and the maximum achievable profit curve $\pi = \text{Max}$, where the limit on the profit level is imposed by the fact that the firm has to pay at least the market wage W_c . In a perfectly competitive system, the zero iso-profit curve $\pi = 0$ would coincide with the maximum acceptable profit curve $\pi = \text{Max}$ and bargaining could not bring about any deviation from the profit maximizing (and the only feasible) outcome at point A. This outcome would reflect the fact that perfect competition eliminates any room for bargaining.

Once (human capital or other) rents exist, the entire area between the W_c line and the curve corresponding to some minimum acceptable profit (e.g. $\pi = 0$) becomes the "zone of possible bargains". The most traditional conceptual framework used for describing union behavior -- the so called "union monopoly model" -- assumes that the union raises the wage above W_c but that management unilaterally adjusts employment. Hence if the union unilaterally (or even jointly with management) sets the wage to \bar{W} , employment would adjust to \bar{L} -- the profit maximizing level of employment corresponding to \bar{W} -- and no labor redundancy would be present from the firm's standpoint.

In many unionized settings the union influences both wages and employment. The influence on employment is either direct through work rules, or indirect through the strategic interaction in

⁸This assumes that there is no government intervention that would induce redundancy.

⁹The maximization of GNP is used because it is the theoretically and practically most appealing case. However, other maximands can be incorporated into the above structure.

repeated bargaining.¹⁰ In general, if the union has some preference for employment, it is possible that the wage-employment outcome lies to the right of the marginal revenue product curve of labor ABB' in Figure 1. The question is whether such an outcome is efficient or whether it implies the presence of labor redundancy. As we show presently, in answering the question one needs to distinguish three concepts of efficiency: (a) efficiency from the vantage point of the management, (b) efficiency from the perspective of the management and union, acting as established bargaining partners, and (c) efficiency from the social welfare standpoint.

From the standpoint of an unconstrained profit maximizing or cost minimizing firm, labor redundancy arises when the marginal revenue product of labor falls short of the wage (labor cost per worker). In terms of Figure 1, all outcomes to the right of the marginal revenue product of labor curve ABB' constitute cases where labor's marginal product falls short of the wage. The entire area to the right of ABB' therefore represents labor redundancy from the profit maximizing firm's standpoint. For any given wage, the firm will maximize profit (minimize cost) by reducing employment to the point of equality between labor's marginal product and the wage.

As mentioned above, in a unionized firm, where the management and labor representatives bargain over wages and employment, an outcome characterized by wages in excess of the marginal product of labor may be Pareto efficient from the private standpoint of the bargainers. The reason for this is that gains from trade may exist if the union is willing to trade wages for employment. This can be illustrated in terms of Figure 1 by the fact that management is indifferent among points B, C, D, E , and F , which all lie on the same iso-profit curve -- i.e., represent different wage employment combinations that guarantee the firm the same level of profit. The contract curve (the set of Pareto efficient outcomes) for the managers and workers may then lie to the right of the marginal product curve of labor (e.g., ACC' , ADD' , AEE' , or AFF') and the firm behaves as if maximizing a positive function of profit, wages and employment.

SOEs are not always established to pursue strict profit maximization. (In the case of increasing returns to scale, profits may even be undesirable.) The performance of SOEs hence has to be assessed with respect to the goals given to them. Naturally, if SOEs were to maximize profit, all the above (union and nonunion) employment and pay practices would fully apply to them. Assume, however, that the government pursues the relatively traditional and widely accepted goal of maximizing GNP. In that case economic efficiency dictates that the SOEs use the shadow price of labor (i.e. the marginal product that this type of labor generates elsewhere in the economy), rather than the actual wage, as the relevant yardstick for setting employment. This means that labor redundancy occurs only at employment levels at which labor's marginal product starts falling short of the shadow (rather than the actual) wage. In the usual case of a downward sloping marginal product curve of labor and the actual wage in excess of the shadow wage, this means that the social welfare (GNP maximizing) criterion calls for higher than profit maximizing level of employment, *ceteris paribus*. Illustrating with Figure 1, suppose that the actual wage paid by the enterprise is W and the shadow wage is W_s . The socially efficient employment level is L^* , while the privately efficient (profit maximizing) level is \bar{L} . In general, for wages above W_s , the curve ABB' gives the profit maximizing outcomes, whereas the vertical curve ADD' depicts the socially efficient ones.

¹⁰See Spinnewyn and Svejnar (1991) for a discussion of the repeated bargaining case.

An important point to stress is that the outcomes along the ADD' curve are all optimal in the static context, when distribution does not affect productive efficiency, but that the picture is less clear in an intertemporal setting. Outcomes that occur above point A imply that workers in a given enterprise get above market clearing wages and that the resources used for paying the wage premium are not allocated for other uses (e.g. productive investment or luxury consumption of the ruling elite).¹¹ This outcome is difficult to judge in general. If these resources were used instead for highly productive investment, the growth of GNP and the social welfare (appropriately discounted) might be higher. If the investment were unproductive or the resources were used for luxury imports, the higher wages paid to workers may be socially preferable -- either on social grounds or on economic principles because higher worker consumption may stimulate demand for domestically produced commodities. In sum, the assessment of the different wage outcomes in the dynamic framework needs to take additional factors into account.

1.2 Implications for the Design of Redundancy Schemes

1.2.1 Determining the Level of Redundancy

As our discussion indicates, the private and social criteria of labor allocation are likely to differ and the assessment of managers about the extent of labor redundancy may not coincide with the society's evaluation of the seriousness of the phenomenon. In particular, it is possible for profit maximizing (cost minimizing) managers to estimate correctly that redundant labor is present at a given wage, while the social (GNP maximizing) criterion indicates that the firm uses too few workers. In terms of Figure 1, this paradoxical situation occurs in the area AB'D' -- an area which may be very sizable if the marginal product curve of labor is highly elastic.

Social welfare maximization is presumably the criterion used by both the government authorities supervising the SOEs and the international organizations. If GNP maximization approximates this criterion, our discussion indicates that shadow rather than actual wages ought to be used in assessing the extent of labor redundancy. Operationally this means that within each skill group redundant labor is equal to the number of workers that would have to be removed in order to achieve full employment and equalize the value of marginal product of labor across firms. Whereas this may be the general optimal rule, there are several considerations that should be taken into account.

For example, in assessing the marginal product of labor within the enterprise, it is important to take into account not only the direct productivity of the marginal workers but also the effect of their presence on others. In particular, it is possible that the low productivity (effort) of the marginal workers has a negative effect on effort of the inframarginal workers. Removing the underutilized marginal workers could therefore have a positive effect on the morale and hence productivity of the remaining workers. If this negative externality in production is present, the overall productivity of the marginal workers may be significantly negative, even if their direct (observed) productivity is slightly positive. This negative morale problem has been particularly serious in socialist economies but it is also significant problem in SOEs in general. A good example is the Uruguay railway, where the redundancy scheme consisted of paying surplus workers and instructing them to stay away from the work premises.

¹¹Note that this point applies to all wages above the market clearing wage and not just to outcomes on the vertical contract curve ADD'.

Another important aspect of the problem relates to the intertemporal nature of the optimization exercise and to the possibilities for factor substitution. An optimizing firm takes into account the relevant exogenous factors in determining its labor use. In the profit maximizing case, for instance, the exogenous factors are the output price, prices of inputs (including the wage if the firm is a wage taker) and technology parameters. In the cost minimization case with exogenously fixed output (e.g. by the government), output replaces output price in the set of relevant exogenous factors. The important implication is that while an efficient firm maintains the equality of labor's marginal product to either the shadow or actual wage, factor proportions and possibly input-output ratios may vary tremendously as the relevant exogenous factors change. Moreover, current decisions that are consequential for the future operations of the firm, ought to take the expected intertemporal evolution of the exogenous factors into account.

As we indicate below, many government officials, consultants and World Bank staff have tended to rely on what has been called the "technical or ratio approach" in assessing the extent of labor redundancy. The approach focuses on technical (productive) efficiency and identifies redundancy through the measurement of factor proportions (e.g. the capital-labor ratio) or the amount or value of output an enterprise can generate from one or several of its inputs (e.g. output-labor or output-capital ratios). The extent of labor redundancy is usually identified by comparing the actual values of these indicators with "experts' assessments" of the optimal targets. The measure that is employed most frequently in analyzing labor redundancy is the output-labor ratio (average labor productivity), although the capital-labor ratio is also frequently used.

At first sight, the technical or ratio approach could be viewed as belonging to the cost minimization paradigm because it sets the optimal employment levels in terms of output-related indicators (e.g. miles or tons per worker). It is also appealing for public policy because it yields simple and easily verifiable targets that can be used for loan conditionality and labor force reduction plans. However, by using simple indicators of this kind, the approach either ignores or treats only implicitly the possibility for optimal factor substitution and scale changes that should be undertaken in response to changes in exogenous prices, technology and other relevant factors.¹² For example, when World Bank staff and government officials agree on conditions such as "the current tonnage per worker is X and in the next five years it ought to be brought to X+Z" (a typical example), they either ignore or make an implicit assumption about the evolution of wages, prices of other inputs and technology (e.g., the speed of electrification in railways or containerization in ports). As our discussion indicates, ignoring these factors would in general be erroneous. Treating them implicitly makes it difficult to evaluate a given scheme and alter it if unforeseen exogenous shocks (e.g. in oil price) occur. As we indicate below, another drawback of the engineering approach is that, from a more general (than GNP maximization) perspective, it does not constitute a bona fide cost-benefit calculation that takes into account the costs of retraining, early retirement and relocation of employees within an intertemporal framework. Finally, a fundamental flaw of the engineering approach is its reliance on average

¹²It is occasionally argued that the ratio approach is justified because the technology in the transport sector exhibits fixed proportions. This is rarely fully the case, especially when one takes into account all the ancillary activities of a given transport mode. However, even if the fixed proportions assumption were tenable, it would merely imply fixed input-input (e.g. capital-labor) ratios. If the production process displays nonconstant returns to scale in the relevant range, the level of output and the output-labor ratio still depend on all the exogenous variables.

indicators, such as the average productivity of labor, to identify a marginal concept (low marginal product of labor). The two concepts are usually functionally related but they rarely coincide.

The conceptual framework that we outlined above relies on marginalist principles and appropriate modifications are naturally required in cases of sizable (nonmarginal) adjustments. For instance, if government ports dominate the port sector and a sizable reduction of stevedoring gangs is considered as a policy option, the wage currently earned by stevedores in the relatively small private sector is not the appropriate shadow wage. Large-scale layoffs in public ports would either depress the private stevedoring wage or, if it is rigid downward, they would make it difficult for the laid off stevedores to find jobs at that wage. The appropriate shadow wage hence has to take into account the alternative jobs open to the laid off stevedores and the probabilities with which these jobs can be obtained.

In general, the evaluation of the extent of labor redundancy in a GNP maximization context needs to be based on the current and expected shadow prices (wages) and technical parameters. The basic comparison in this framework is between the marginal value product of labor in the SOE and the shadow wage. In the simplest conceptual framework, the extent of labor redundancy is then given by the number of workers whose marginal productivity falls short of the shadow wage. In a more complex and realistic framework, allowance has to be made for management's expectations of future changes in the relevant exogenous variables and the corresponding optimal hoarding of certain types of labor within an intertemporal framework.

1.2.2 The Framework for Selecting an Optimal Redundancy Scheme

The basic principle for designing and selecting among different labor redundancy schemes is that of social benefit-cost analysis. In each case the government ought to select the scheme that has the highest net social benefit. In terms of our conceptual framework, the selected scheme should be the one that most increases social welfare, given the systemic and environmental constraints. Since some schemes may be designed and implemented within a changing system, the relevant systemic constraints are naturally those that are to prevail from the time of the implementation.

Within the GNP maximization framework, the basic social criterion for designing the scheme is the elimination of the difference between the marginal revenue product of labor outside of the firm, R^* , and the marginal product of labor inside the firm R . Since labor redundancy implies that $R^* > R$, the optimal scheme would transfer labor from the enterprise to the higher productivity (alternative) uses until $R^* = R$.

In those cases when the social welfare function incorporates other considerations, the $R^* - R = 0$ criterion may have to be extended. For instance, if the government needs to reduce a budget deficit, this may be given weight in the benefit-cost analysis. The government may want to consider the labor cost saved by the public sector as a result of the removal of redundant labor, LC , as well as the amount of severance pay S that the public sector must pay the laid off workers. While in the strict GNP maximizing cost-benefit calculus LC and S would be treated as transfers, in a period of a budgetary stress these may be relevant factors in selecting redundancy schemes. Since in this context LC is a benefit and S is a cost, the relevant principle is to select redundancy schemes on the basis of their present value, defined as

$$\sum_{i=1}^I \frac{LC_i + R_i^* - R_i - S_i}{(1 + r)^i}, \quad (1)$$

where r is the discount rate, i is an index of time and I is the horizon of the scheme. The discount rate reflects how present vs. future oriented the government is, and I , the time frame, reflects a government's concerns about political stability, and budget constraints.

We have used the payback period and internal rate of return variant of this formula to evaluate specific redundancy schemes in the case studies. The payback periods, calculated on the basis of equation (1), are reported in Table 5. Note that the formula in equation (1) is broader than the one that would be used if the firm considered only its profit and ignored the economy-wide (GNP maximization) principle:

$$\sum_{i=1}^I \frac{LC_i - R_i - S_i}{(1 + r)^i}. \quad (2)$$

1.2.3 Monitoring and Adjustment of Schemes

The conceptual framework also implies that the implementation of the optimally designed scheme should include monitoring as a standard feature that ensures that the scheme delivers the intended benefits. This means continued changes in the system (e.g. personnel practices and possibly laws) and in the elements of the scheme in order to reach the optimal pay and employment levels. Exogenous factors will usually alter the initial targets and unforeseen problems with the design of the scheme will invariably arise. These factors alter the level of redundancy and the original results of the social benefit-cost analysis underlying the scheme.

However, just as expectations of future developments play an important part in the design and adjustment of an optimal scheme, one must also take into account the effect of ex post adjustments of the redundancy scheme on agents' expectations and the possible derailment of an entire scheme. As our review of various experiences reveals, if the possibility of adjustment is likely to result in an abusive change of the scheme by a particular interest group, this ought to be taken into account (as a cost) in the ex ante benefit-cost calculation about the desirability of an adjustment of the given scheme.

2. THE DETERMINANTS OF THE REDUNDANCY PROBLEM

2.1 Principal Sources of Labor Redundancy

The problem of labor redundancy in state owned transport enterprises is difficult to forestall and cure because it is created by numerous factors, more than one of which is frequently present. Most causes can be classified as arising from: (a) a decline in the demand for labor, (b) financial constraints, and (c) government regulations and practices that increase employment for purely social reasons. See Table 1 for a summary of the principal sources for each case.

2.1.1 Decline in Demand

The findings from our case studies and from Galenson (1989), from which this section borrows heavily, indicate that the decline in the demand for labor in a particular enterprise arises primarily from a decline in the demand for the service due to competition, general economy-wide recession, labor-saving technical progress and/or organizational change. In some cases (e.g. Ghana) the optimal quantity of labor demanded also falls as a result of a sizable rise in real wages over time.

The decline in demand for labor due to **competition** includes competition from the private sector that provides a better service in the same or alternative mode of transportation. The bus sector has been deregulated in several countries and the private bus companies have in many cases mushroomed (e.g. Sri Lanka), taking business away from some of the public bus routes. Competition from the rapidly growing road transportation sector has displaced the demand for railway transportation, especially for passenger transport, in a large number of countries, including Chile, Costa Rica, Ghana and Yugoslavia. In Brazil, the decline in demand is limited to passenger traffic as freight traffic has been increasing substantially over time. Costa Rica and Sudan provide particularly telling examples. Costa Rica's railway traffic dropped from about 1.7 million tons of cargo in 1975 to about 0.7 million tons a decade later as the country's road system developed and a competitive trucking industry emerged. As a result, nearly all of the approximately 2,800 staff are estimated to be redundant, as is most of the railway operation itself. In Sudan, the railway from Khartoum to Port Sudan has seen its annual freight traffic decline from 3.5 million to 0.6 million tons over fifteen years. Yet the labor force of 33,000 has been retained.

In some cases, such as Ghana, Sri Lanka and Yugoslavia, a persistent **economic crisis** contributed to the decline in demand for the output of particular transportation SOEs. The overall decline in economic activity also reduced the shadow wage, however, and the impact of the recession on the extent of labor redundancy is therefore difficult to determine.

Technological change in the transport sector has invariably reduced the total number of laborers required. This has certainly been the principal cause of labor redundancy in the port sector with the advent of containerization, as well as the new automated processes now used for loading and unloading ships and maintaining ships and facilities. It has also been a principal cause of redundancy in the railways. The switch from steam to diesel locomotives and the electrification of lines has played an important part in reducing the demand for operating and maintenance personnel in all the case studies.¹³ Technological change has also altered the optimal skill mix, a phenomenon that has been especially pronounced in ports.

The decline in the demand for labor can also arise from **changes in the organizational structure** of the enterprise. For example, the merger of the individual railways into the federal railway in Brazil meant the elimination of many previously duplicated activities. Similarly, the repeated reorganizations of the Yugoslav railway system as well as the changes of the definition of an enterprise brought about shifts in labor demand.

¹³The introduction of diesel locomotives has for instance eliminated the need for the second man in the cab. The introduction of both the diesel and electric locomotives greatly reduced the need for maintenance and repair staff.

A sizable increase in real wages can also generate redundancy. In the case of Ghana's industry, the cheap wage policy pursued during the colonial period was followed by a sizable rise in real wages in the post-independence years. Note, however, that in terms of Figure 1 a mere rise in wages along the (socially optimal) vertical contract curve ADD' would not result in labor redundancy from the social standpoint unless the rising wage bill forced the enterprise to bankruptcy. Redundancy would occur, however, if the shadow wage $W_c = R^e$ also rose but less than the wage in the firm, or if the marginal product curve of labor shifted leftward (a fall in demand). The social desirability of above market wages from the intertemporal standpoint also needs to be taken into account.

Finally, a decision to privatize can be a source of labor redundancy in that the private criterion of efficiency can require less labor. In almost every case, the government is required to shed excess labor before selling the enterprise. The Sri Lankan Transit Board is a case in point.

2.1.2 Financial Constraints

While investment in a labor-saving technology can lead to labor redundancy, the lack of investment in existing capital can do so as well. If an enterprise is financially unable to repair or replace its equipment, the same number of employees who might once have operated the firm efficiently may well become excessive. The Ghana Omnibus Service Authority is an extreme example. Over the years, the lack of imported spare parts and new buses led to a situation where in 1988 the staff to operating bus ratio reached 55:1. The management, believing this shortage of parts to be temporary, was reluctant to lay off staff. The situation in Ghana's other public bus companies (State Transport Corporation and City Express Services) and in Sri Lanka's Transport Boards, while less extreme, was analogous. In terms of our conceptual framework, the decline in availability of other inputs (e.g. capital) results in a leftward shift of labor's marginal product curve and a rise in labor redundancy.

Labor redundancy also arises as budgetary stress induces a major decline in the purchase of cooperating inputs. This is a widespread phenomenon in the public sector of developing countries in general. Many civil service reforms, brought about by declining budgets, have resulted in sharp cutbacks in nonlabor inputs (e.g. fuel in the case of highway maintenance) but only in limited or no reductions in employment. The result in these situations has been a sharp decline in labor productivity.

2.1.3 Government Hiring and Firing Policies

Governments often use the public sector as a source of employment for social and political reasons, especially during periods of declining demand. In our sample, politically motivated hiring was detected in all countries except possibly Mauritius. In many countries this general policy has been formalized with decrees imposing hiring quotas on both the public and private sector. In many cases these decrees increase employment beyond the levels desired by the manager, hence directly creating redundancy from the private though, as we noted earlier, not necessarily the social standpoint. In Kenya, for instance, a presidential decree of 1978 simply directed the private sector to increase employment by 10%.

Another extreme example is the system of permanent contracts (employment guarantees) found typically in socialist countries (Egypt and the former Soviet bloc countries) as well as many other developing countries (e.g. Senegal and Ivory Coast). Moreover, hiring in many countries takes the form

of mandated hiring of certain groups, usually those completing a particular level of schooling. In Senegal, for example, the government, as the employer of last resort, used to hire automatically all graduates of universities as well as of secondary and professional schools. In Yugoslavia, the railways had to train (and often retain) graduates in proportion to existing employees. However, a number of countries - the Central African Republic, Mali, Saudi Arabia, Senegal and Togo, among others - phased out the promise of jobs in the face of shrinking public sector budgets.

In other cases, there is simply constant pressure on the directors of state owned enterprises from presidential or ministerial levels to hire as many unemployed workers as possible. This was for instance one source of excess labor in the bus and port sectors of Ghana and Sri Lanka, as well as in the Chilean ports and railways during the Allende period.

SOEs often provide certain goods or services in order to fulfill political or social objectives. In the transport sector, unprofitable routes are often retained to provide cheap access for certain segments of the population. In virtually all the cases studied, we found that passenger fares were subsidized by the government and unprofitable passenger routes were often maintained. An especially interesting example that was not in one of our case studies is the Pakistan International Airlines. PIA considers one of its foremost contributions to the national economy to be the provision of low cost air services to inaccessible and less developed regions of the country, while losing an estimated Rs. 170 million (U.S. \$10.6 million) on domestic routes in 1984/85. Whether or not such services are justified and the employed workers redundant of course depends on their shadow price (i.e. the underlying social welfare function). There is no doubt, however, that in most cases that we examined the employees on the margin produced significantly less than their marginal cost or shadow wage.¹⁴

2.2 Factors Preventing Reductions in Employment or Wages

Although exogenous factors such as declining demand for labor may be the immediate cause of labor redundancy, the inability of the enterprise to adjust its labor force sustains the problem. The failure to adjust employment to a socially or privately efficient level can stem from a variety of causes. Frequently, politically or socially motivated laws (e.g. labor laws protecting workers from being fired) and bureaucratic constraints (e.g. with respect to hiring) will induce inefficiency from both the private and social standpoint. Trade unions and other workers' organizations often promote work rules of various types in order to induce work safety and job security. Sometimes employers promote work rules to prevent workers from avoiding certain tasks such as demarcation among different types of workers.¹⁵ As is clear from our conceptual discussion, some of the rules and constraints may be efficient. However, from the standpoint of public policy it is important to identify which ones are operating and determine their private and social desirability. Rules that make sense under one set of conditions may be rendered obsolete by another, but laws, custom or strong interest groups may delay

¹⁴The subsidies needed for keeping some of these firms operating are often hidden (e.g. exemption from taxes or artificially low fuel prices). A given branch of the government (e.g. the supervisory ministry) may not even be aware of their true cost and hence be unable to judge whether the subsidies divert users from more efficient alternatives.

¹⁵In the ports the so called "continuity rule" was for instance imposed by the employers to prevent workers from abandoning a poorly paid or difficult cargo when a more attractive cargo arrived. See e.g. Harding (1990).

their revision. To the extent that these practices interfere with the efficient allocation of labor in the economy, they may reduce output and welfare. The two most salient examples of restrictive practices are manning rules and constraints on labor mobility.

2.2.1 Manning Ratios

Rules requiring a fixed number of workers for a particular task are usually established in collective bargaining agreements with respect to a particular technology, for which they may be economically appropriate. However, when new technologies are adopted, custom, or more commonly a union desire to prevent unemployment of members, sometimes result in the maintenance of the old ratios even when they imply very low marginal productivity of labor. To the extent that the enterprise is privately owned and the agreement is voluntary, the outcome is privately, though not socially, efficient. In the case of an SOE, however, social efficiency is the relevant criterion and the inefficiency derived from this restrictive work practice ought to be the focus of public policy.

Examples of excessive manning ratios can be found in all transport modes. In ports, the size of the gangs that load and unload cargo, while originally based on the number of men needed to process a certain number of individual crates or bags per unit of time, became excessive in the context of modern port technology. While general cargo gangs range from around 15 to 35 workers, the standard gang size under a container system normally ranges from 6 to 10. Under the manning rules, workers are able to extract the rent arising from the introduction of new technology and the number of workers paid frequently exceeds the number actually doing the job. In some U.S. ports the nonworking gang members have to be present in the port, thus having zero marginal product. In other U.S. cases, the idle gang members are able to hold other jobs and share their port and outside income with those who perform the port work. In this latter case the idle port workers contribute a positive marginal product elsewhere in the economy and the manning ratios induce a redistribution of income but not necessarily misallocation of labor in the economy. A variant of the latter case existed in Chile in the 1970s as the entry of labor was restricted and licensed port workers rented their work permits for half the wage to other workers. The rent involved was significant enough that these latter workers, called "half chickens", in turn rented the license to other workers, the so called "quarter chickens". With the exception of Chile and recently Ghana, the ports examined in our case studies all display a variety of rent sharing and restrictive work practices (e.g. strict demarcation of hours of work and number of shifts).

In extreme circumstances, excessive gang sizes can crowd the work place to the point that the marginal product of labor becomes negative. For instance, after container cranes had been installed in the port of Bombay, 22 workers continued to be employed per container crane on the quay, where only 1 or 2 were needed. Similarly, 6 workers continued to work on the ship, where 1 could do the job. As Couper (1986) reports, productivity in the port was below the average even for break bulk cargo - about 17 tons per gang-hour, compared to a normal 25 tons.

Examples of problems with obsolete manning ratios in the railways include the difficulty with eliminating the second man (fireman) in the cab when railways switched from steam to diesel locomotives and the resistance to eliminating the guard when cabooses were replaced with rear-end

marker devices. Collective bargaining agreements often provided for these positions to be maintained.¹⁶

2.2.2 Geographical and Organizational Constraints

One method used by trade unions to protect the jobs of their members is to negotiate geographic or organizational rules for allocation of work. An example is a rule requiring that any work done within certain boundaries be carried out by union members. In Costa Rica, the railway unions have been able to enforce a rule that workers on the Atlantic line cannot be replaced by or used to replace workers on the Pacific line. In the United States the longshoremen have enhanced their job security by securing the clause that within fifty miles of the port, cargo must be handled by U.S. longshoremen or a royalty must be paid (the "fifty mile rule"). A similar rule existed in the United Kingdom, although it was later amended (Harding, 1990). Finally, in the port of Buenaventura, Colombia, all work in the adjacent free zone is included in the port labor agreement.

2.2.3 Labor Legislation and Custom

Labor legislation and traditional employment practices can be an important cause of inflexibility in labor markets. All the socialist economies as well as many diverse developing countries such as Brazil, Ghana, India, Ivory Coast, Panama, Senegal, and Sudan have for long periods severely limited the employer's right to fire workers.¹⁷ For instance, in Yugoslavia (as in other socialist countries) workers were until recently legally protected against layoffs brought about by variations in the economic performance of their enterprise. The only exception was in the case of enterprise bankruptcy which was a rare event. In countries such as Brazil, Ghana, and Sri Lanka, the restriction on layoffs was implicit. Layoffs were stipulated to be a permissible managerial action but the socio-political atmosphere was such that managers rarely entertained the idea of resorting to layoffs.¹⁸

Among the countries not examined explicitly in our case studies, Panama and Senegal have exemplified the most highly regulated labor markets. Senegal's Labor Code of 1961, and the modifications adopted since then, for instance severely regulated all the major components of labor market operations. The Code limited the use of fixed term contracts and made open-ended (permanent) employment the prevalent form. Layoffs of workers with open-ended contracts had to be approved by a labor inspector, and his decisions could be appealed as far as the Supreme Court. Layoffs could only be justified by serious misconduct on the part of the worker or difficulties brought

¹⁶In the airline industry, there were similar problems encountered as companies attempted to eliminate the third man in the cockpit with the introduction of modern navigational and video display technology.

¹⁷In the French speaking developing countries, some of these practices can be traced to the Labor Codes originating in the French Overseas Labor Code. Indeed, in France itself it was not until reforms initiated by Prime Minister Chirac in the early 1980s that employers could lay off workers without securing prior authorization from the Labor Ministry.

¹⁸In Ghana there have also been special regulatory restrictions imposed on the SOEs. For instance, the dismissal of five or more workers from SOEs must be authorized by the Ministry of Labor, except when criminal offense can be proven.

about by an act of nature (such as a fire). An economy-wide recession was not adequate justification (see e.g. Terrell and Svejnar, 1989).¹⁹ Other interesting examples of government restrictions include India, where firms with more than 100 workers cannot lay off workers without the permission of the local government, and the Sudan, where termination of employment used to require a Presidential decree.²⁰

2.3 Factors Leading to a Decision to Reduce Excess Labor

Given the desire of governments to build a political base in view of significant and often rising urban unemployment, it is not surprising that labor redundancy is usually a persistent problem. The task of cutting back the number of workers in the public sector is made all the more difficult when those who stand to lose are represented by strong unions and can potentially bring about political upheavals. As a result, developing country governments frequently take decisive actions only when they find themselves in the position to do little else.

The evidence from a number of countries indicates that the most important catalysts in the decision to tackle the problem of redundant labor are the poor financial performance of the SOEs, unsustainable government budget deficits, the advent of a new government, public outcry about the rents reaped by certain groups, and loan conditionality imposed by foreign lenders.

When governments can no longer continue sustaining losses of the SOEs, they become much more willing to take the painful decisions to improve their efficiency. The governments usually reach this situation after an extended period of losses by the SOE sector and government budgetary deficits. The reduction of variable costs becomes an important target of the SOE reform and labor cost represents a sizable share in this category.

As can be seen from the cases of presidents Pinochet in Chile, Premadasa in Sri Lanka, Rawlings in Ghana, and Castelo Branco in Brazil, the decision to undertake a reform of SOEs is often made by a new government (see also Table 1). Of course, the downfall of the previous government may be intimately connected to these economic problems and the new government may be brought in with a mandate to solve them. Yet, a new government is not always able to deal with the problem immediately in all sectors. For example, while the Pinochet administration rapidly started the process of reduction of personnel in the public sector, it took almost six years before it tackled the ports. By then it had obtained significant public support by informing the public about the sizable rents that the private port workers were reaping through the system of permits (licenses) and the negative effect that the system presumably had on the functioning of the entire Chilean economy.

Interestingly, as can be seen from Table 1, a conservative political orientation of the government does not seem to be a necessary condition for taking decisive steps to reduce the size of SOEs in the transportation sector. The socialist government in Mauritius laid off 2,609 people (66% of the port workers) in one year. Some 3,500 port workers were induced to leave voluntarily under a social-democratic government in Sri Lanka in 1972 and the socialist government of Yugoslavia closed

¹⁹The restrictions in Côte d'Ivoire have been similar though perhaps not as severe as in Senegal.

²⁰The procedures were eased somewhat in 1983 when the government permitted a discretionary discharge of workers who were absent for three consecutive weeks.

down about 25% of total route-km of its railways between 1960 and 1980. However, overall evidence around the world suggests that conservative (market-oriented) governments are more prone to be concerned about the financial performance of the public sector and hence take action to eliminate labor redundancy.

Of course, as mentioned earlier, many governments have since the late 1970s had to take resolute actions as credit became tighter and public debts reached unsustainable levels. This general climate has also been a factor in inducing governments that otherwise might not have taken action to do so, even in times when the labor market is generally depressed (e.g. Sri Lanka). In Chile, the port restructuring scheme was carried out in spite of the downturn in the economy in the two years that followed its introduction. In this case, the negative economic environment may have in fact helped the success of the scheme by forcing the workers to return to the port earlier than they might have otherwise.

In many cases, an important impetus for undertaking background studies, restructuring SOEs, and reducing redundant labor was the position of the World Bank and other lending institutions. In virtually all the cases we studied, World Bank technical assistance or loan conditionality was instrumental in focusing the attention of the government on the issue of labor redundancy and formulating specific policies to deal with the problem. While in some cases, such as Ghana and Yugoslavia, this phenomenon is relatively recent, in others (e.g. Brazil) it dates back to the 1950s and 1960s.

3. FINDINGS ON THE EXTENT OF REDUNDANCY, POLICIES AND SCHEMES

As we have indicated in Part 1, the identification of a socially optimal employment level in a given SOE is a prerequisite for arriving at an appropriate estimate of the extent of labor redundancy. The design of optimal redundancy policies and specific schemes in turn needs to be based on this estimate as well as assessments of the social costs and benefits of labor adjustment. In this section we review the main approaches that have been used to estimate the extent of labor redundancy and to design policies and redundancy schemes.

In order to provide a comparative analysis, we have collected data in the six countries covered by our project on a) the methods used to identify the extent of labor redundancy; b) findings on the extent of redundancy; c) the nature of the policies and redundancy schemes; and d) the compensation packages available for redundant workers. To make our findings as representative as possible, our discussion is based on these data as well as on information about practices in other countries.

3.1 Methods Used to Identify the Extent of Labor Redundancy

In the extreme cases when all workers are clearly redundant, the estimation of the extent of redundancy is naturally straightforward. These clear cut situations arise for instance when a given section of a transport mode is to be closed down (e.g. the closure of uneconomic railway lines in Yugoslavia) or when all workers are to be replaced by a new mechanical process (e.g. in the Mauritius Bulk Sugar Terminal).

In most other cases the situation is not as straight forward. There is usually a variety of perceptions about the extent and location of redundant labor within an enterprise and political as well as technical factors are frequently brought to bear on the economic decision. However, as mentioned earlier, when quantifying the overall extent of labor redundancy, the most common approach has been the "engineering approach", which focuses on technical (productive) efficiency as proxied by output-input (e.g. output-labor), input-input (e.g. capital-labor) or factor cost to total cost ratios. The measures identify redundancy by examining the quantity or value of output an enterprise can generate from one or several of its inputs and by examining its factor proportions. It ignores economic aspects such as the possibility for factor substitution and actual as well as shadow prices.

In the railway sector one of the most common measures used is the number of traffic units (i.e. the number of passenger kilometers plus the number of freight ton kilometers) per employee. According to railway specialists, a reasonable yardstick currently used for railway efficiency is about 500,000-600,000 traffic units per employee in pure freight transport and about 200,000-250,000 traffic units per employee in pure passenger transport. The exact numbers of course differ over time and across countries. Nevertheless, the measure was used in all the railways we examined - Brazil, Chile, Ghana, and Yugoslavia. Brazil was the only country where other criteria also received comparable weight. In Chile, the director of the railway used this output/labor ratio in addition to capital/labor ratios in 1973 to conclude that a 30% across the board reduction in personnel would not affect the functioning of the railway. In Ghana, the value of this ratio in the Cameroon and other regional railways served as a yardstick for the railway's employment and redundancy policies as well as for World Bank conditionality. In the Yugoslav railways, the so called systematization exercise based on this ratio underlay the careful plan for labor force reduction in the 1980s. Evidence from other countries indicates that the use of this measure is indeed widespread.

In the bus sector, the number of employees per operating bus (a labor-capital ratio) is the single most important measure used to determine the level of redundancy. The difference between the actual ratio (13.1) and the optimal ratio of 6.5 employees per operating bus was used as the rule of thumb to determine the level of redundancy in the Sri Lanka Transport boards. Similarly, in Ghana's public bus companies, external consultants, enterprise managers and the supervisory government agencies all used this criterion to set employment targets for the companies. The number of employees per bus exceeded 10 in all of Ghana's public bus companies during the mid 1980s and in some of the companies it was in excess of 20. The reduction of labor in accordance with this indicator became a primary concern. The optimal target of 5 employees per bus was set by the director of Ghana's City Express Services after observing English and Indian public and private bus companies. Other Ghanaian companies used consultant's opinions and other sources of practical information to establish similar target values of this indicator.

In the port sector, the perceived "best practice" ratio of the number of workers per ton transported depends on whether the transport is in the form of conventional (or bulk) cargo or containerized unit. As we noted earlier, the former is often seen as requiring gangs of 15-35 men, while in efficient ports the latter is processed with gangs of only of 6-10 individuals. The Mauritius Marine Authority estimates it has some labor redundancy based on the optimal gang size for container traffic.

Overall, it must be stressed that in most cases that we examined, the directors of SOEs, external consultants and government officials also considered other quantitative and qualitative measures to assess the extent of labor redundancy. Given the importance of financial constraints, one frequently

consulted indicator was the ratio of labor cost to total cost. (Like the labor-output ratio, it is a partial indicator; however it is a broader measure because it considers both relative quantities and prices.) Almost invariably, enterprise directors consulted the heads of the divisions to determine the number of people needed by skill level and organizational unit. In many cases, the SOEs also relied on reports of external consultants. However, the recommendations of the divisional chiefs and consultants were frequently not clearly substantiated or relied on the very same ratio indicators. Hence the basis for most estimates of labor redundancy has been the "technical ratio approach", adjusted by financial and political considerations.

The question that naturally arises is how different these estimates are from those that would be obtained using the social welfare approach. While we address this question below, it is worth pointing out that in the cases that we examined no explicit social welfare approach was in fact used.

3.2 Findings on the Extent of Labor Redundancy

Given that systemic features of most countries impose significant costs on rapid and sizable labor adjustment, estimates of labor redundancy usually exceed the number of people laid off in the first major waves of retrenchment. In the case of the recent redundancy schemes, it is possible to obtain data on both the estimated excess labor and the layoffs. In the more historical case studies, it was often impossible to distinguish clearly between the estimated extent of redundancy and the number of people retrenched. In these circumstances the reliable data were those related to layoffs.

Evidence from our case studies, summarized in Table 2, as well as comparative data collected by Galenson (1989, pp. 82-83) indicate that the official estimates of the absolute and relative magnitudes of labor redundancy in the transport sector are very large. Brazil's federal railway (RFFSA) for instance estimated that it inherited "tremendously excessive" staff when it was created as a merger of 18 railways in 1957. In accord with the country's emphasis on minimizing the social cost of labor dislocations, RFFSA adopted a gradual approach (the so called policy of minimum trauma) toward eliminating redundant labor. As a result, despite significant growth in traffic, RFFSA gradually reduced employment by 30% between 1964 and 1975, and by 60% between 1965 and 1988.

In Chile, the port authority (EMPORCHI) carried out one of the most ambitious and rapid layoff schemes in the world. EMPORCHI undertook a detailed functional analysis across all organizational units in view of the legally permitted entry of private companies into its previously protected activities, and laid off 56% of its labor force in 1981. The extent of labor redundancy in the private (stevedoring) operations of the Chilean ports could not be estimated,²¹ but the 1981 elimination of all restrictive practices associated with the pre-existing closed shop resulted in a sizable increase in various indicators of port efficiency. Finally, the Chilean railway enterprise (EFE) reduced its staff by a full 50% (13,000) in the 1975-79 period and analysts subsequently believed that EFE still employed some excess staff.

²¹Since stevedores are usually employed by many companies and organized by a number of trade unions, it is difficult to measure employment and labor redundancy in this segment of port operations (see also Harding, 1990).

Ghana Railway Corporation (GRC) accepted a consulting firm's estimate of 28% labor redundancy in 1978. After reducing its staff by 30% between 1978 and 1986, GRC agreed with the World Bank to reduce employment by another 18% between 1987 and 1992. By 1990 the railway had already succeeded in reducing its labor force by 15%. In Ghana's public bus sector, labor redundancy was estimated at 54% in the State Transport Corporation in 1987 and 71% in the City Express Services in 1988-89. Both companies started layoffs in 1989, and by the middle of 1990, the former had laid off 15% and the latter 35% of their respective employees. Ghana Ports and Harbour Authority was generally aware of its historically excessive labor force; employment was decreased without any specific goal by 20% between January 1986 and July 1989. However, in the meantime, the management reviewed all port operations and, with the aid of the same consulting firm as was used in the railway, arrived at an estimated 50-55% labor redundancy in 1989. After negotiations with the union and government, management laid off 32% of the labor force in one month (August, 1989), and another 40% by the end of 1989.

In Mauritius, the creation of the new sugar terminal made 87% or 2,609 of the port workers redundant. Determining the number of workers was fairly straightforward since it was all the workers that loaded bags of sugar. However, selecting the people who would be laid off was not so straightforward since a portion of the work force only unloaded sugar part of the time.

The World Bank staff estimated that about 40% or 20,000 employees in the Sri Lanka Transport Board were redundant at the end of 1989. Here the ratio of employees to the existing stock of operating buses was used as the method to determine the number of redundant employees. However, toward the end of 1990 the government was investing in rebuilding the buses that were out-of-service, which of course revises the estimate of redundancy.

In Yugoslavia, the railways reduced their labor force by 12% from 1964 to 1973 as market-oriented reforms were introduced, uneconomic lines were closed and the railways switched from steam to diesel locomotives. For a variety of political and institutional reasons employment increased back to the earlier level in the 1970s and 1980s. The official April 1990 estimate put labor redundancy in the Yugoslav railways at 11% and the 1989-93 loan agreement with the World Bank envisions a 1.5-2% annual reduction in the labor force.

If uneconomic lines were closed in Costa Rica, it has been estimated that 96% of the railway employees would become redundant. This estimate assumes that these lines can not be made profitable, which the Costa Rican railway managers are currently researching.

Clearly, the magnitude of the problem is varied and generally significant. The solutions have been also varied and had diverse impacts on efficiency, government budgets and individual as well as social welfare.

3.3 Nature of the Policies and Redundancy Schemes

As can be seen from the summary indicators in Tables 2 and 3, the redundancy schemes examined in our study vary considerably in term of the groups or individuals who designed the scheme, the speed of labor force adjustment, the reliance on voluntary vs. involuntary separation, and other aspects of implementation.

3.3.1 The Decision Making Process

As far as the design of the scheme is concerned, on one extreme is the Chilean case, where the policies and schemes were formulated at the very top by members of the presidential economic team and carried out by enterprise directors who cooperated with the team. In the case of the Chilean railway, there was virtually no involvement of the higher-level managerial staff. Each manager was handed a list of names of people that the director general proposed for layoffs and the managers were only given the power to strike off a certain number of names. The situation was similar in the Chilean port authority except that managers were involved in the information gathering stage. To induce truthful revelation of labor redundancy, the managers' own job security depended on the quality of information they provided. This information was evaluated by the personnel director's team with a visit to each workshop. The Brazilian experience falls near this extreme. Their railway enterprise management autonomously designed the schemes within a broad policy outline and budgetary constraint imposed by the government.

Yugoslavia represents another extreme, where the railway workers were involved from the decision on line closures to the design of employment generating projects for redundant employees. The other principal co-decision makers were managers and government officials.

Numerous intermediate cases span these extremes. Most relied on "tripartite committees", comprised of government, employers and the trade unions, to negotiate the terms of the scheme. This was the case for instance in Ghana and Mauritius. Moreover, the role of outside organizations, such as the World Bank, was in many cases very significant.

3.3.2 Voluntary vs. Involuntary Nature and Time Frame

The redundancy schemes also vary widely in terms of their voluntary vs. involuntary nature and their time frame. On one extreme is what can be called the **voluntary-attrition slow-time-frame** model. The success of this model relies on factors such as compliance with restricted hiring, alternative sources of employment in the economy, an older labor force in the enterprise, growing output demand, and the ability of the government to sustain (presumably lower) losses over a longer period of time. The model was used in the Brazilian railways, where the railway staff was reduced by 60% over a period of two decades, as well as in the Yugoslav railways, where the reductions were more moderate. As noted by Havlicek (1988), this is the approach used most frequently in the more developed countries.

While the voluntary-attrition slow-time-frame approach has been successful in many countries, it can be a failure if the government's resolve to implement the scheme is weak. This was clearly demonstrated in Sri Lanka following the 1982-1986 period of gradual labor force reduction in the Transport Boards. The scheme was not fully accepted by all the parties and, as soon as the centrally imposed restrictions on hiring were removed, employment rose back to the original levels.

At the other extreme is the **involuntary-layoff rapid-time-frame** model, which was used in the Chilean railway and port authority, Ghana's ports and buses and in the main port of Mauritius. The Chilean, Ghanaian and Mauritius cases indicate that this scheme can be implemented in extreme political environments (e.g. a socialist government and a military dictatorship). In all the cases the cause for the drastic nature of the scheme was the alarm about the perceived harm to the economy at large. These schemes tend to be successful in terms of eliminating the redundancy problem, but they tend

to have high social and political costs. Moreover, there is the potential danger that the scheme can overshoot by eliminating too many workers, given the future development of exogenous factors. It is possible that the gradual rise of employment and redundant labor in Yugoslav railways after the closure of noneconomic lines was in part motivated by the perception that some closures represented an overshooting.

The intermediate schemes rely on a variety of measures that are deemed appropriate for the specific systemic and environmental setups. These include the modification of existing collective bargaining agreements (e.g. in Colombian ports), the replacement of existing agreements by others with a possible compensation for the conceding party (e.g. Australian as well as U.S. East and West Coast port agreements), and the government-ordered change of existing institutions (e.g. in Spanish ports).²²

3.3.3 Retirement

Strict enforcement of the retirement age alone or in combination with a reduction of the mandatory retirement age were effective measures in Brazil and Yugoslavia but they have proved to be impractical in countries with a relatively young age structure (e.g. Senegal). The measure is generally useful as an element of long term programs. Voluntary early retirement is another option used (e.g. in Ghana's railway, Sri Lanka's public bus company and Singapore's port). The principal drawback of this method is that it usually results in a suboptimal skill mix unless restrictions are imposed on the early retirement option of employees in specific groups. Moreover, both methods can result in the loss of the most productive workers.

3.3.4 Redeployment

Redeployment of workers to other government or private organizations has been used as a means of reducing excess labor in a number of instances. The Brazilian railways used this method in some periods and the pre-1990 Yugoslav approach was based almost entirely on this principle. Similarly, the Uruguayan and Costa Rican governments have promised the railway workers that no one would be laid off and they have taken extensive measures to place these workers elsewhere in the government.

Redeployment is a procedure that is appealing in systems that place high emphasis on workers' employment (but not necessarily job) security. From the standpoint of the SOE that tries to redeploy its workers, the procedure is viable only if other employers are willing to hire. In case of government organizations, this usually means that they must not be suffering from a budget squeeze. From the social welfare standpoint, redeployment to other government organizations makes sense if they themselves do not suffer from labor redundancy and/or if there is a general hiring freeze in the public sector. Finally, a practical problem of this method is that it makes it difficult to achieve optimal skill matching.

²²See Harding (1990) for more details.

3.3.5 Restrictions on Hiring

These restrictions are frequently used as complements to other employment policies aimed at reducing redundant labor. They range from total hiring freezes to limited hiring of certain groups (e.g. locomotive drivers or maintenance workers). The principal advantage of hiring restrictions lies in minimizing the negative impact of labor adjustment on worker-insiders and in preventing excessive hiring in SOEs that operate under soft budget constraints. The 1980s experience in the Sri Lanka Transport Board, where the benefits derived from hiring freezes one year were completely nullified in the following year, is a case in point. It indicates that for effective reductions in force to take place, these restrictions may have to be in place for several years.

As the Brazilian experience demonstrates, however, the negative aspect of such a long term policy is that enterprise performance may suffer due to inadequate replacement of workers with crucial skills. This suggests that the optimal period during which the government should impose a hiring freeze depends on the starting conditions, the optimal length increasing with the softness of enterprise budgets, the desire to protect insiders and the ability of the enterprise to staff adequately its principal activities.

3.3.6 Training

Surprisingly, training was rarely used on a large scale as a means to alleviate the redundancy problem. Where it was used -- Brazilian and Yugoslav railways and Sri Lankan ports -- it has proved to be a very effective method for dealing with labor redundancy brought about by the introduction of new technology. The Sri Lankan Port Authority created a Training Institute which has contributed to both increased port efficiency and reduction in the number of redundant unskilled employees. In Yugoslavia, the socialist system guaranteed workers employment but not job security. As a result, rotation and redeployment were standard features of the system and the socially owned enterprises provided the necessary retraining. In Ghana, retraining for redeployment was supposed to be an important element of the redundancy program but it was never implemented on a large scale.

The lack of training at the firm level often reflects the costs and benefits of training relative to other procedures. The Chilean railway for instance had in-house training facilities but, given the extent of redundancy, the government philosophy and the cost of layoffs to the firm, the railway found it more efficient to rely on layoffs as a means of solving its labor redundancy problem. Furthermore, in certain sectors (e.g. ports) technological change often results in far lower need for labor and shifts existing demand to different skills. Retraining costs would often be prohibitive or retraining may be simply impossible, given the abilities of the existing labor force. The Ghanaian situation is an example of these problems.

3.3.7 Reduction of Restrictive Work Practices

Reduction in work rules is usually an important component of labor redundancy schemes designed in highly restrictive environments, especially the ports. However, politically this is a very difficult issue because the elimination of work rules usually alters significantly the bargaining outcome between the workers and the enterprise. Port activities are for instance often characterized by rents and trade unions have historically secured a share of these rents through the negotiated wages and

restrictive work (employment) practices, such as large gang sizes, limited number of short shifts and highly paid overtime.²³ In terms of our conceptual framework, these voluntary bargaining agreements are frequently socially inefficient but they may be Pareto efficient from the standpoint of the workers and management. Moreover, if these agreements are concluded between private (stevedoring) enterprises and trade unions, the society is frequently hesitant to impinge on a voluntary private contract.

One extreme course of action is exemplified by the case of the private operations in the Chilean ports, where the government eliminated all work rules in 1981. After unsuccessful negotiations with the unions the government forcefully "bought the book" of work rules. The government unilaterally abolished all restrictive practices based on worker registration cards (licenses). In return, it offered workers who turned in their cards a compensation that averaged US\$ 19,084 per worker and ranged from \$10,000 to \$ 200,000.²⁴ This action was highly controversial both within Chile and internationally. It constituted an attempt by the economically liberal government to raise port efficiency (and hence improve social welfare), while compensating the party whose private economic contract it violated in the process. The impact on the workers was hard to assess as they received a relatively large initial lump sum payment but by all accounts suffered a lower earnings stream for the remainder of their working life. Efficiency in port operations has increased tremendously with flexibility to hire as needed.

The case of Mauritius presents another extreme, with the government making an agreement with the unions that there would be no change in the work rules after the agreed upon layoffs connected with the new Bulk Sugar Terminal. Since then, the Mauritius Marine Authority and the Cargo Handling Corporation have been struggling to maintain an efficient operation with restrictive work practices including no double shifts, obsolete gang sizes and restrictions on mobility of gangs between ships. They have been constantly negotiating with the unions to replace these inefficient work practices with new agreements.

Yugoslav socialism offered workers employment security but eliminated work rules and claims on specific jobs. As in the case of large Japanese firms, this system limited involuntary interfirm and interregional labor mobility but enhanced intrafirm labor flexibility.

Reforming work rules may be the most effective way of gaining flexibility in the labor market. In many instances, this can considerably increase the productivity of existing staff without loss of jobs. Strategically, it appears that the best time to obtain concessions on restrictive work practices is during the downturn in economic activity. The unions tend to be willing to forego these practices if they are able to preserve jobs. The employer can then reduce redundant labor by not hiring during the economic upturn.

²³For a review of restrictive work practices in ports and railways see Harding (1990) and Beshers (1991), respectively.

²⁴These figures were provided by the Camara Maritima de Chile. CEPAL (1990) gives a somewhat lower but still sizable average compensation figure of US\$ 12,800.

3.3.8 Privatization

Selling off the enterprise to workers (as in the case of the Sri Lanka Transport Boards), or to others in the private sector, is a possible method of reducing redundant labor in the public transportation sector. There have been several cases of privatization of the airlines which seem to have been effective. Discussion is currently taking place in some countries (e.g. Argentina and Chile) about privatizing segments of the railways. However, because of its relatively small capital requirements, the bus sector is probably the easiest sector to privatize, especially if it is sold to the workers. Given the experience of the Sri Lanka Transport Boards, privatization of the bus sector may be the best way to manage public sector redundancy there. However, before an enterprise can be sold, the redundancy problem must be solved. Hence, privatization does not mean that the problem can be avoided, only that once solved (and the enterprise is sold), it need not be a concern of the government in the future.

The success of the privatization approach of course hinges on the ability of the private firm to avoid some of the factors (e.g. government regulations or union agreements) that prevent the SOE from reducing redundant labor. The experience with privatization in the port of Bangkok indicates that this private sector advantage is not always easy to obtain.

A partial solution can be to subcontract various activities, such as maintenance, to the private sector. This helped reduce labor costs in the Chilean railways as well as in Ghana's ports and in Ghana Highway Authority. Finally, opening up formerly exclusively public activities to the private sector competition (as for instance in the case of the Chilean onshore port activities and the shed work at the port of Manila) is a form of privatization that can both worsen the problem of excess labor in the government organization and hopefully contribute to its solution.

3.4 The Compensation Package

As is evident from Table 4, all the schemes we analyzed, whether voluntary or involuntary, offered some compensation to the affected employees. The form of compensation varied from case to case, with the main elements being special compensation pay, severance pay, special loans for laid off employees, and pension benefits or provident funds (whichever was applicable). In all of the countries under study laws were already established on procedures and amounts of compensation. Moreover, except for Brazil which had an unemployment compensation fund and a social security system in place at the time, there were essentially no other "safety nets" legally provided by the government.

The size of the compensation varied tremendously, ranging from one-half of a month's salary per year of service with a maximum of 7.5 months (the port workers in Sri Lanka in 1980) to 3-6 months of pay per year of service (as was promised but not delivered to Ghana's public bus service workers). As mentioned above, the on-ship port workers in Chile received considerable severance pay for turning in their registration cards and they still retained the right to seek work in the ports afterward.²⁵ Those that were eligible for pension received both the pension and the severance pay.

²⁵The size of the package is not clearly influenced by the philosophy of the government in power. If anything, there may be a negative correlation between the orientation of the government toward labor and the size of the compensation, as seen from comparing the compensation of workers in Chile (in 1981) vs. Mauritius (in 1980) and Sri Lanka (in 1972). One possible explanation is that economically

However, in most cases the amount of the pension actually received was quite small relative to total earnings.

From the point of view of the enterprise and government, all of the compensation packages, except the Ghanaian ones, were financially sound. Where it was possible to calculate the payback period, we found it ranged from 4 months to 4.7 years. The compensation package offered by the Ghanaian government also has a payback period of only 1 to 5 years but the cost of the scheme is clearly beyond the current cash flow of the SOEs and will require credit from the international donor community if it is to be carried out. The evidence from other countries also suggests that the savings outweighed the costs of the schemes in a relatively short time. The problem therefore does not appear to be the net benefit of the schemes but the lack of immediately available funds to carry out the schemes.

From the perspective of the employee, the evidence in our case studies indicates that the compensation payment is often spent rapidly without any visible long term benefits. In cases where the compensation is significant, future compensation schemes should consider providing counselling and structuring the payments in such a way as to enable the worker to make best use of the money. In cases of individuals that are highly risk averse and not entrepreneurial, the best method might be compensation in regular installments over extended period of time, together with assistance on investment of the funds (as the World Bank is for instance currently doing in the Central African Republic in a small loan program). The installment method would make it easier for the government to meet the payments but the scheme may not be viable in countries with high inflation or where the government is not widely trusted. Entrepreneurial workers are likely to be better off receiving a lump sum payment together with business information and potentially training.

4. EVALUATION AND LESSONS FOR POLICY

The main results of our investigation suggest that labor redundancy can be a very severe problem and that redundancy schemes tend to have a high rate of return (short payback period). The case studies that we undertook also indicate that redundancy is not always an easy concept to grasp and operationalize. The extent of labor redundancy can therefore be disputable and the design and implementation of redundancy schemes is often controversial. In this part we evaluate the main findings of our research and draw policy conclusions.

4.1 The Main Findings

4.1.1 The Severity of the Problem

Our principal factual finding is that state owned transportation enterprises frequently face a major labor redundancy problem. The roots of the problem are in some respects analogous to those

liberal governments tend to have greater respect for property rights and feel more obliged to compensate the workers for the elimination of their economic rents.

found in the public sector in general (protracted economic crisis, government hiring and firing practices, lack of complementary inputs due to financial constraints, restrictive labor legislation, etc.). However, many are also sector specific, such as declining demand due to competition or technological change, restrictive work practices and organizational constraints.

In the six countries that we studied intensively, the extent of estimated redundancy varied from 11% to 100% of the labor force. While 100% redundancy usually arises only before plant closing,²⁶ our general finding is that 20-60% redundancy is not an infrequent phenomenon. The problem is usually so sizable that the first round of labor force reduction (e.g. 30% in the Chilean railways) would probably be within the redundancy estimates obtained by both the engineering and social welfare approaches. The difference between the two approaches stands out more when redundancy falls into the 10-20% range. In this latter situation, the estimates based on ratios given by the "best foreign practice" may differ sufficiently from those based on marginal productivity and shadow prices in the economy.

4.1.2 Costs and Benefits of Redundancy Schemes

From a strict GNP maximizing point of view, the reduction of a firm's labor force is justifiable if the marginal product of labor is less within than outside the enterprise. All the redundancy schemes that we examined were defensible on this criterion since the marginal product in the firm appears to have been always zero or negative (the removal of workers never decreased output) and the laid off workers always faced a significant positive probability of obtaining a productive job. (The case of Mauritius may be an exception.)

In some of the studies we were also able to take into account the financial benefits (savings in the labor cost) and costs (severance pay and supplementary pension for early retirees) of the schemes. As can be seen from Table 5, the payback periods calculated with these "transfer payments" included in the formula were very short and the redundancy schemes fared well on a variety of other partial indicators of performance as well. Our calculations, based on a variety of more and less conservative assumptions, suggest that the payback period varied from 0.3 to 4.7 years in those redundancy schemes where this calculation was possible. In other cases the more qualitative evidence also points to a very high rate of return. The main factor driving this impressive result is the nonrecurrent nature of the severance pay and the recurrent saving of labor cost. The force of this principle is not always fully understood, thus occasionally creating reluctance on the part of the authorities or international organizations to institute or provide funding for redundancy schemes (e.g. currently in Ghana).

The other reason for the reluctance of foreign donors such as the World Bank to finance severance pay is that severance is not viewed as a "productive purpose" -- a precondition for lending in the Bank's Articles. As the benefit-cost analysis itself indicates, severance is logically a productive investment. It is concentrated as a cost at the start of the project and results in an intertemporal stream of benefits. These benefits are productive in the most basic sense. The redundancy scheme removes unproductive labor and thus increase the productivity of the firm. Moreover, so long as the expected productivity of the redundant labor is greater outside than within the firm, the productivity

²⁶The 100% labor redundancy occurred prior to the closing of the Bulk Sugar Terminal in Mauritius.

of the society as a whole (GNP) is increased. The reluctance to finance redundancy on these grounds is hence logically misconceived. It is probably driven by the perception that productive investments occur (solely) in the capital market. However, redundancy schemes, like human capital, can be highly productive.

All but one of the schemes we examined achieved the goal of significantly reducing if not completely eliminating the redundancy problem for extended periods of time. The most successful schemes in this respect were those in Brazil, Chile and Mauritius, some schemes in Ghana and the uneconomic line closures in Yugoslavia. There is hope that the current Sri Lanka bus scheme will also be successful. The one clear cut failure is the Sri Lanka Transport Board scheme, where during the 1980s employees were induced to leave with compensation and virtually simultaneously were being rehired. This case illustrates the importance of government resolve and accountability for success. Somewhat related is the case of Yugoslav railways where, given the overall political and social atmosphere in the 1970s and 1980s, labor redundancy gradually recurred after the closure of uneconomic lines.

Most of the successful redundancy schemes also resulted in a significant improvement in economic efficiency and financial performance of the enterprise. However, as Tables 6 and 7 show, this is not always immediately evident from simple ratio indicators. The labor cost as a percent of total costs in all modes of transport were reduced, except for the Brazilian (RFFSA) and Ljubljana railways; the working ratio remained constant or showed improvement in almost all cases (Table 6). The productivity indicators for the railways show tremendous improvements in TU/man year in all countries (Table 7). The productivity indicators for the buses do show some improvement in the number of employees per operating bus but this also has to do with the number of working buses, which was fallen in both Sri Lanka and Ghana. No improvement in the traffic per bus indicator is shown in these two countries.²⁷ Clearly, it is difficult to associate each of these performance indicators with the redundancy scheme, holding all else constant. Various other factors are affecting these measures. Hence, we can only make the following general statements: The reduction of redundant labor has had a significant impact on enterprise performance when labor cost was a large proportion of total cost or when labor was replaced with capital-intensive technology (as in the case of Mauritius). Given the importance of labor in total cost in general, a significant reduction in excess labor can by itself result in a substantial improvement in enterprise efficiency. However, more complex schemes that also address other aspects of enterprise performance, such as marketing and output growth, investment and pricing policy, tend to have a greater positive effect. Our case studies of Chilean, Mauritian and Sri Lankan ports as well as Brazilian and Chilean railways also indicate that, from the standpoint of enterprise efficiency, a very important aspect of the government employment policy is the reduction of restrictive work practices.

The most negative aspect of many redundancy schemes is the impact on the affected workers. Schemes that rely on permanent layoffs tend to lower the laid off workers' incomes, although the virtually universal lack of post-layoff monitoring makes it difficult to gather reliable evidence on this subject. The incomes of the remaining workers often tend to rise faster than they would have in the absence of layoffs, as the financially invigorated enterprises can pay more to motivate the remaining

²⁷Comparable productivity indicators across all of the ports in the study could not be found.

employees. The overall impact on workers hence depends on the job opportunities elsewhere in the economy and the relative weight given to the laid off and the remaining employees.

In our studies, the schemes with the most negative impact on workers were those in the Chilean railway (1975-79), Ghanaian buses (1989-90) and ports (1985-89), Mauritius ports (1980) and Sri Lankan ports (1972). In these schemes people were for the most part laid off during a period of limited outside employment opportunities and received only modest compensation. Many appear to have suffered extended spells of unemployment and in some cases (e.g. port workers in Mauritius and Sri Lanka) observers claim that the majority of the laid off workers never found new employment. Given that there were no other forms of a social safety net (e.g. food stamps) in these countries, the welfare of the workers was clearly poor. Schemes which redeployed or retrained redundant workers (e.g. Brazil's railway and Sri Lanka ports in the 1980s or Yugoslav railways until 1990) or allowed them to leave voluntarily obviously placed the worker on a higher level of welfare than the more abrupt schemes based on layoffs.

The political cost of redundancy policies and schemes did not appear to be prohibitive in the cases under consideration. In fact, the political cost was significantly reduced when the governments publicized the underlying reasons and highlighted the size of the rents earned by the groups imposing (or benefitting from) restrictive work practices (e.g. in Chile and Sri Lanka). Sometimes the government (e.g. Brazil and Uruguay) can be assisted by strikes that backfire. If they are handled carefully (e.g. providing alternative transportation for passengers, as Uruguay did) the government has a stronger political position for closing out a line.

It must be stressed, however, that political factors often give rise to redundant labor in the public sector. Moreover, the potential political cost associated with large scale layoffs usually prevents existing governments from facing the problem. The fact that substantial redundancy schemes tend to be adopted by financially strapped governments which can blame external lenders or by new governments with a strong mandate to reconstruct the economy testifies to the presence of significant political costs and benefits in this area.

4.2 Methodological and Policy Issues

4.2.1 The Complexity of the Issue

The concept of redundant labor is not a simple one. As we have shown in Chapter 1, the optimality of given employment and pay practices depends on a number of factors, including particular social preferences as well as the importance of specific human capital, cost of labor turnover, relative risk aversion of the worker and the firm, bargaining, and asymmetrically observed effort. In the absence of these factors, the labor market would be flexible and competitive, with labor's marginal product and wage (for a given skill) being equalized across uses. In this flexible case labor redundancy would not arise.

Once some of these complicating factors are present, optimal employer policies or employer-worker contracts may result in marginal products that are not equalized across uses. Moreover, if wages are set above the market clearing (shadow wage) level, profit maximizing levels of employment are too low from the social (GNP maximizing) standpoint. This is because the profit maximizing criterion dictates that employment be adjusted so that labor's marginal product equals the actual wage, while

the GNP maximizing criterion equates the marginal product to the (lower) shadow wage. Depending on union preferences, collective bargaining can result in deficient or excessive levels of employment from the social (GNP maximizing) perspective. It is hence possible for a profit maximizing employer to view a given level of employment as excessive, although from a social perspective it is insufficient. Similarly, while the union and profit maximizing employer may strike an optimal bargain that reflects the union's willingness to trade off wages for employment, from the social perspective the employment level may be excessive.

The extent of labor redundancy hence depends on the perspective taken in evaluating a given case. As we have mentioned earlier, from the strict GNP maximization perspective, redundant labor ought to be reduced to the point of equality of labor's marginal product within and outside the enterprise. Yet, this simple rule may be inadequate if the aforementioned factors are relevant. For instance, if trade unions are legally permitted and the collectively agreed upon wage-employment bargains reflect union's emphasis on employment (and hence its willingness to take less in wages), the resulting low marginal product of labor in the firm may not warrant government initiated layoffs.²⁸ Similarly, if the management and union agree on restrictive work practices, the government may find it philosophically difficult to abrogate the contract and eliminate the practices.²⁹ The government may also find that a firm paying high (efficiency) wages to elicit effort hires too few workers from the social welfare standpoint. Yet, forcing the firm to hire more workers or preventing layoffs would undermine the firm's effort eliciting strategy.

4.2.2 Identification of the Extent of Redundancy

As the foregoing discussion indicates, identifying the extent of redundancy is conceptually not a simple task. Our view is that in practical policy work the basic social welfare principle of equating the marginal products of labor (of a given skill) across uses is the best basic yardstick but that the resulting estimates of labor redundancy ought to be adjusted for the effects of other relevant factors. For instance, temporary labor hoarding brought about by the cost of firing and hiring of workers or by the expectation of future price or input supply developments may be optimal from both the enterprise and the economy-wide standpoint. Similarly, in greatly fluctuating demand conditions, the smoothing of wages and employment may benefit both risk averse workers and risk neutral SOEs. Hence, a reasonable approach will strive to equate the marginal products of labor (of a given skill) across uses in the economy but allow for optimal temporary deviations along the lines suggested in this study.

In practice, most policy-related analyses of the extent of labor redundancy rely on average rather than marginal indicators. As we mentioned earlier, consultants, government officials and World Bank staff tend to use "engineering (ratio) measures" such as the enterprise output-labor, capital-labor and labor cost-total cost ratios, which are then compared to "experts' assessments" of optimal targets

²⁸Note if the government forced the SOE management to renege on the employment aspect of the wage-employment deal and lay off workers, in the following negotiations the union would use its power to push for higher wages along the marginal product of labor curve. The outcome would be Pareto inefficient from the management-union standpoint and, if the resulting wage were high, employment would also be deficient from the social standpoint.

²⁹The agonizing of the Chilean government on this issue is an interesting case in point.

for these variables. Labor redundancy is usually identified as that reduction in enterprise labor force that would bring the actual ratios in line with the optimal targets.

This approach is conceptually inappropriate in that it uses average indicators (e.g. average labor productivity) to detect a phenomenon that occurs on the margin (low marginal productivity of labor). While the average and marginal products are usually functionally related, they coincide only under restrictive technological assumptions. Moreover, the ratio approach either ignores or treats only implicitly the possibility for factor substitution and scale changes that the enterprise should undertake in response to changes in exogenous factors. In fact, in the cases that we examined, the adjustment of the actual to the target ratios was to be accomplished mostly or entirely by the adjustment of the labor input or labor cost. The possibility of a major adjustment in the other side of the ratio (e.g. output scale or capital) was usually not considered.

The other salient feature of the engineering (ratio) approach is its reliance on expert assessments of optimal ratios. These optimal ratios usually correspond to some "best practice" observed in another economy. While the knowledge of practices in more advanced countries is useful as a yardstick for comparison, the cross-country variation in factors such as terrain, infrastructure, technology, and skills make rigid application of external standards questionable.

All these shortcomings of the ratio (engineering) approach of course contrast markedly with the simplicity and clarity of targets that it produces. These targets lend themselves easily for stipulating loan conditionality and specifying redundancy schemes, thus accounting for the widespread use of this approach. Yet, as we indicate, if the engineering approach is to be justified, it must be done on the basis of sheer convenience and data availability, rather than conceptual desirability and precision of the resulting estimates.

For these reasons, our recommendation is to replace or at least complement the engineering approach with the marginal productivity approach outlined in Section 1.1 of this study. The basic practical problem with using the marginal productivity approach is of course the fact that the key indicator -- the marginal product of labor -- is unobservable. However, our experience in this and other labor market investigations indicates that enterprise managers usually have a good idea about the marginal product of labor in individual departments, divisions and shops of the firm. In particular, the managers confidently identify the number of workers that could be removed without diminishing the division's or shop's output. To their credit, it must be noted that the redundancy schemes that we examined in this study did not result in a fall in output. The approximate identification of the number of workers with zero marginal product hence appears not to be very difficult. To identify the shadow wage (marginal product of labor) in the economy and the number of workers in a given enterprise whose marginal product falls short of this value is perhaps somewhat harder. Yet, a reasonable magnitude of the shadow wage can be estimated by country economists on the basis of the available data on earnings in the formal and informal sectors, as well as estimates of unemployment and underemployment in the economy. This is especially the case in view of the usually enormous magnitude of the labor redundancy problem. Our conclusion is therefore that the marginal productivity approach, taking into account the expectations of future developments as well as particular institutional features discussed above, is the most appropriate methodology for identifying redundant labor.

Whenever possible, the approach ought to rely not only on expert opinions but also on econometric estimates.³⁰

A note of caution is in order here. In practice, the extent of labor redundancy is often so sizable that the first round of labor force reductions is likely to fall within the redundancy estimates obtained by both the engineering and social welfare approaches. The differences between the two approaches is likely to stand out more when redundancy falls into the 10-20% of the labor force range.

4.2.3 The Design and Implementation of Schemes

As our analysis indicates, the issue of labor redundancy is a complex one and it does not lend itself to a uniform and simple treatment. In operational work it is hence necessary to take into account the specific circumstance of each case in order to design the best approach to the problem. In particular, in approaching the problem one should start with an **assessment of the extent of the problem**, using the methodology discussed above.

The second step should consist of an **examination of the causes of redundancy**, distinguishing between the exogenous environmental factors (e.g. state of the economy, technological progress, changes in markets), systemic factors (laws, institutional structures such as trade unions, and accepted practices) which may be predetermined in some cases but possibly subject to change in others, and factors and policies that may be better designed to prevent the recurrence of redundancy (e.g. the financial situation of the government or the enterprise, the autonomy of the SOE, etc.).

In the same exercise one needs to carry out an **identification of factors that prevent the adjustment of employment and/or wages to an efficient level once redundancy occurs**. The most important of these usually are restrictive work practices, geographical constraints, labor legislation, public opinion (social pressure), and custom. An effective approach to these factors may prevent redundancy from becoming a problem. External shocks will always cause redundancy to occur but it is the lack of flexible response that makes the phenomenon become a protracted and costly problem.

The third step involves the **design and implementation of an optimal redundancy scheme**. In designing and implementing redundancy schemes, one has to take into account both the aforementioned conceptual issues and the practical problems that accompany all socially disruptive projects. On the conceptual side, the evidence from the various cases indicates that the handling of redundancy is easier if the government from the outset specifies and obtains support for a clearly defined employment and pay policy *vis a vis* the SOEs. In approaching the redundancy problem in specific SOEs, the government and SOE management achieve a strong position if they first prepare a solid case that identifies the causes, extent and precise location of redundancy, justifies the methodology used to arrive at the estimates, and explains why a particular redundancy scheme (e.g.

³⁰See e.g. Brada (1989), Card (1986), Brown and Ashenfelter (1986), MaCurdy and Pencavel (1986) and Svejnar (1986) for examples of econometric studies that provide parameter estimates that are relevant for identifying the extent of redundant labor.

layoffs) is proposed over alternatives. A tight link among the various elements of the package (causes, extent, and proposed approach) makes the proposed scheme operationally superior and socially acceptable.

On the practical side, the case studies as well as other evidence suggest that the success of the scheme often depends decisively on the cooperation of the affected workers and other parties. This evidence in turn offers several guidelines for facilitating the agreement on and implementation of redundancy schemes. First, the government should assess if the proposed compensation for the laid off workers is adequate by established practices and expectations. As the results in Table 5 indicate, since the cost of severance pay is nonrecurrent while the benefit of labor cost savings is recurrent, the financial benefits rapidly exceed the costs of the scheme. The government may therefore want to transcend the usual budgetary concerns and offer extra severance to the laid off workers. This is especially the case if the transfers are limited and do not affect the effort and hence productivity of the remaining workers.

The second key to broad acceptability appears to be the availability of "expert opinions." In the presence of uncertainty, incomplete information and limited education on the part of workers and trade union officials, the confirmation of the extent of redundant labor by reputed experts can significantly aid the approval of the measure. The expert studies in Ghana and Yugoslavia are good examples of this phenomenon.

A related factor is the involvement of workers and trade unions in designing the scheme and their understanding of the fact that the enterprise might not survive without it. The significant participation of workers or their representatives in the preparation of the schemes in Mauritius, Yugoslavia and the bus companies in Ghana was crucial for the passage of the schemes.³¹ Similarly, the personnel chief of EMPORCHI in Chile reported that her intensive consultations with workers overcame much opposition to the large scale layoff scheme. The last example is particularly significant because the consultations took place in an industrial relations environment that did not require worker involvement in an area of managerial prerogative.

In many developing economies capital markets are imperfect and laid-off workers may not have an easy access to capital for the launching of new economic activities. In these circumstances, it may be socially as well as economically desirable for the government to step in and provide seed capital — either in the form of greater severance pay (as in Chilean ports) or in terms of loans (Chilean railway). There seems to be no universal evidence on whether the optimal severance payment should be one shot (thus allowing the laid off workers better to start their own business) or in the form of long-term periodic payments (thus providing longer sustenance). Indeed, economic theory suggests that the former scheme is better for enterprising individuals and the latter for those who are either risk averse or fiscally irresponsible. It hence appears that allowing fiscally responsible workers to self-select themselves into one of these (actuarially identical) schemes, may be the best general approach. In situations of high economic uncertainty and nonexistence of a social security system, the encouragement of the system of periodic payments may be desirable. However, in situations

³¹Note that the union was also closely consulted in the case of Ghana ports but workers (as opposed to union leaders) rejected the scheme. As this result indicates, the structure and cohesion of the union is also an important factor that needs to be taken into account.

characterized by high inflation or government instability the system of periodic payments may be perceived as unreliable and hence unacceptable to the workers.

Government provision of credit is also justified when the redundancy schemes are sound but, in view of existing collective bargaining agreements, the SOEs have to pay significant severance in the case of layoffs. If the capital market does not provide enterprises the necessary credit, the high financial rate of return of the redundancy scheme may justify the government and international lending institutions to step in and provide the credit. For instance, the 1990-91 situation in Ghana is one where such a step would be both socially and financially desirable.

In economic activities with significant rents (e.g. ports), workers frequently feel that they have acquired certain property rights to these rents. They are therefore reluctant to leave employment even if given a relatively generous compensation (as for instance in Chile, Ghana, and Mauritius). The conceptual difficulties associated with handling such cases have been mentioned earlier. In practice, once an agreement on labor force reduction has been obtained, experience suggests that the severance payments should be disbursed only when the workers return all enterprise property and legally accept the outcome. The Chilean and Ghanaian port experiences also suggest that worker acceptance is more likely if the payment of the full severance is available only during a specific and well publicized period, with the amount of payment declining with time after the deadline. These elements were part of the scheme in Chile but not in Ghana. While in Chile the severance package and the outcome was generally accepted, in Ghana it was rejected and resulted in a protracted legal battle.

If the labor redundancy scheme is part of a measure that has an impact on a broader segment of the society (e.g. the closure of uneconomic railway lines), it is important to take steps to overcome public discontent that could derail the project. The Yugoslavs and Uruguayans appear to have succeeded remarkably in this respect, involving the community and diffusing the negative preconceptions of the concerned citizens. Community involvement also helped in devising the best alternatives for local transport and for economic activities of the displaced workers.

Opposition to the scheme is also reduced if the scheme is part of a larger effort that contains other complementary measures. In Ghana, the larger effort came in the form of a widespread reduction of excess labor in the civil and educational services as well as in SOEs.³² In Chile and Sri Lanka, the complementary schemes included liberalization and entry of new firms as well as general reduction in the size of government. The positive impact of the package on output and efficiency was hence magnified and the entry of new private firms (e.g. in ports) meant that the absorption of laid off workers into productive activities was easier.

Macroeconomic conditions will influence the type of scheme chosen. For example, the complementary measures mentioned above are especially necessary during periods of high unemployment. It is for instance generally easier to negotiate a reduction of restrictive labor practices

³²While the larger scale of layoffs may make the absorption of laid off workers more difficult and thus weaken worker support, it also makes the measure fairer. In the Ghanaian case there was a general perception that the public and educational services as well as many SOEs suffered from severe labor redundancy and the need to take a fair action was broadly accepted. Note also that, while a large scale effort requires more sizable funding of severance, the ultimate saving is also magnified.

in the downturn of the business cycle when the labor market is slack, provided the employer is willing to yield on layoffs and rely on voluntary separations instead.

Interestingly, our study suggests that whether the labor force reduction is voluntary (compensation-induced quits) or involuntary (layoffs) does not affect the overall success in eliminating redundancy. It does suggest that if voluntary separations are used, incentives may need to be higher. This is especially the case if redundancy is caused by restrictive work practices. Moreover, if redundancy is caused by excess staff in specific categories and quits are to be induced by incentives, the incentives should be restricted to the specific groups to avoid unwanted brain drain and limit the cost of the scheme.

Finally, it is necessary to stress that in most cases a large variety of labor redundancy schemes is potentially available and that different ones may be optimal in different systemic and environmental settings. Hence early retirement may be appropriate if the age structure and skill of the labor force is favorable and layoffs are socially unacceptable (as was the case for instance in Brazil and Yugoslavia). Layoffs and spinoffs of activities to private contractors may be socially appropriate solutions in systems that place low value on job security and emphasize the growth of private initiative (e.g. in Pinochet's Chile). Redeployment and imaginative job creation was used successfully in Uruguay and Yugoslavia, while hiring freezes with (or without) retraining appear to be beneficial short-term measures in many countries.

In sum, the design of an optimal redundancy scheme needs to rely on a thorough and widely respected assessment of the extent and causes of redundancy as well as of factors that prevent automatic (albeit perhaps gradual) adjustment of employment to an efficient level. Using this information, the design and implementation must take into account the following factors:

- The nature of the normal **decision making process** (participatory vs. top-down);
- The desirability of a **voluntary vs. involuntary approach**;
- The need for a **slow vs. rapid approach**;
- The possibilities (demographic, legal, skill-mix related, etc.) for using **retirement** as an effective means of reducing redundancy;
- The possibilities and desirability of **redeployment**;
- The desirability of relying on **hiring restrictions** or **hiring freeze**;
- The expediency of **(re)training** part of the redundant labor force;
- The need and possibilities for **reducing restrictive work practices**;
- The possibility of achieving adjustment to an optimal employment level in the context of a larger process such as **privatization** of the enterprise;
- The optimal nature of the **compensation package** for the affected employees.

Since a successful redundancy scheme has to balance the twin goal of economic efficiency and political acceptability, the architects of any given scheme need to use the degrees of freedom offered by these factors and design a scheme that maximizes efficiency within the constraints given by the country's system and environment.

4.2.4 Monitoring, Evaluation and Policy Adjustment

One of the most striking findings of our investigation is that few redundancy schemes were subject to ongoing monitoring and none went through a rigorous *ex post* evaluation.³³ Political factors (e.g. reversals) were the reason for this shortcoming in some cases but, more generally, labor redundancy schemes do not appear to have been treated conceptually on par with other economic projects. Frequently, once the "battle to launch the project had been won", the authorities did not deem it necessary to allocate resources for monitoring and future assessment.

Our conceptual framework and the practical evidence suggest that monitoring, evaluation and optimal adjustments ought to be an integral part of redundancy schemes. Indeed, many schemes have important intertemporal components and optimal implementation requires monitoring, diagnostics and adjustments in view of unexpected variations in relevant external factors. Apart from enabling the government officials and SOE managers to react to external changes, monitoring and evaluation activities provide the necessary incentives for all the concerned parties to live up to their original agreements and jointly agree on optimal adjustments.

4.2.5 Sustainability

One of the most important lessons stemming from our studies is that the sustainability of the reduced employment levels depends on the willingness of the SOEs and the government in general not to (re-) hire workers after the completion of the exercise. The problem is usually one of keeping the commitment in the face of specific pressure groups and avoiding unpublicized policy reversals (e.g., violation of the hiring freeze). Adopting clear-cut measures that help maintain the commitment may be very useful. The decision by the Ghana Railway Corporation to circulate monthly computer printouts with the names and addresses of all new hires has for instance virtually eliminated hiring of relatives and friends — a major source of illicit hiring in the past. In this context, an important institutional feature is the existence of a well functioning personnel office. Up-to-date and easily accessible information on the current structure of the labor force, with detail on each employee, is crucial for the design, implementation and sustenance of a given employment policy.³⁴ Another set of measures which would work toward this end is to give enterprises more autonomy from central government control and at the same time clearly define narrower productivity related goals for the enterprises. Privatization of the entire enterprise is the final step along this continuum and would of course rid the government of any future concern about labor redundancy within their domain.

³³The observed monitoring was usually undertaken in the presence of a World Bank loan conditionality.

³⁴It is claimed that there were often cases when the same person that had been compensated to retire permanently from the Sri Lanka Transport Boards in the 1980s was rehired by another board soon thereafter because of a lack of a good personnel system.

However, privatization of various services (e.g. maintenance of the trains in Chile) can (but may not always) assist in managing a problem of excess labor and reducing labor costs to the government.

Another important element of the scheme is the meticulous elimination of work rules and other practices if their elimination was called for in the redundancy scheme. The strategies vary from drastic elimination of all rules at once (e.g. Chile) to gradualist where one work rule is chipped away with negotiation (e.g. Mauritius). As Harding (1990) points out, the difficulty with the gradualist approach is that advances in one area may have to be at the expense of giving way in another (which is clearly happening in the Mauritius case). Again, the joint government and SOE management determination to carry out the scheme and make its results stick aids the long term success of the project (e.g. in Chile and Ghana). A lukewarm commitment (as for instance in Yugoslavia and Sri Lanka in the early and mid-1980s) easily derails the scheme.

4.3 Conclusions

Our investigation indicates that labor redundancy in public sector transportation enterprises is frequently a very serious and costly problem. The analysis of this problem has been neglected, largely because conceptually it is not a simple and easily identifiable phenomenon and because its treatment is frequently controversial from the social welfare standpoint and costly politically. Governments therefore tend to approach the problem only in extreme circumstances (e.g. budgetary stress or near complete breakdown of the transport system). The solutions are then hammered out in a tense environment and often they are not embodied within a long-term vision of the optimal employment and pay practices for the enterprise, or public sector at large.

The first step in designing a redundancy scheme is to be clear about what the optimal pay and employment policies should be in a given system and environment. The study discusses some of these policies and their tradeoffs and emphasizes the need for designing a redundancy scheme and policies to work toward this ideal.

The study presents a framework for identifying labor redundancy within different countries whose social welfare functions vary with respect to the weight given to efficiency vs. equity. A rule-of-thumb for identifying labor redundancy is developed for those cases where GNP maximization is the goal of a government. It is shown that the private and the social assessment of the extent of labor redundancy can differ substantially and that the former is not always the appropriate measure.

The analysis of the experiences of state-owned transport enterprises in six countries suggests that redundancy schemes can have a high rate of return and can be designed in a socially acceptable way. Given the long-run savings on the wage bill, compensation to laid-off employees can be set at fairly high levels and still enable the government to recoup their costs in a relatively short time. Cash-flow problems however may require the assistance of international donor agencies. Attention needs to be given to how this compensation is administered as this can make a difference to the welfare of the worker.

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Table 1
Sources of Labor Redundancy and the Principal
Systemic and Environmental Features

Country	Transport Mode (Enterprise)	Source of Labor Redundancy	Systemic and Environmental Factors				Avg. Annual GNP Growth
			Workers Unionized	Restrictive Work Rules	Government Philosophy	Change in Government Philosophy from Previous Regime	
BRAZIL	Railway (RFFSA) 1965-88	organizational changes, political appointments, technological change, competition from road transportation for passenger transport	yes	some	1964-84: market oriented military dictatorship; 1985-88: less market oriented democratic government	yes	1965-88: 5.8%; 1981-83: -2.4%
CHILE	Ports (EMPORCHI) 1981	decision to privatize part of services	no	none	1973-89: market oriented, military dictatorship	yes	1981: 5.3%; 1982-83: -7.5%
	Ports (Private Sector) 1981	technological change, restrictive labor practices	yes	many	"	yes	"
	Railway 1975-79	technological change, competition from road transportation	yes	some	"	yes	1975: -12.9%; 1976: 3.5%; 1977-79: 8.8%
GHANA	Railway 1975-90	colonial legacy, layoff forbidden by law, government subsidization of losses, technological change, deterioration of capital stock, competition from road transport, institutional change	yes	some	1975-89: socialist; 1983-90: market oriented social-democratic	yes	
	Buses (STC) 1989-90	lax hiring policies, political pressure, skill composition of initial labor force, fall in the number of buses, social unacceptability of layoffs	yes	none	"	yes	5%
	Buses (CES) 1989-90	same as STC	yes	none	"	yes	5%
	Ports 1985-89	historical inability of management to lay off staff, subsidization of losses, presence of economic rents; merger of two institutions, social orientation of government, mechanization	yes	some	"	yes	5%
MAURITIUS	Ports 1980	new sugar terminal (technological change)	yes	yes	socialist however in 1979 became market oriented		-8.8%
SRI LANKA	Ports 1972	reduced traffic demand due to national policy; and later containerization	yes	yes	socialist, state domination of economy	yes	2.0%
	Buses 1981-86	political pressure, deterioration of buses, competition from private sector	yes	none	market oriented	yes	5.0%
	Buses 1990	decision to privatize	yes	none	market oriented	no	1.8%
YUGOSLAVIA	Railway 1969-86	closure of uneconomic lines, dieselization & electrification, political pressure	yes	none	socialist labor managed; 1973-86: market oriented; 1986:	yes	1969-79: 5.6%; 1979-85: -0.9%
	Railway 1980s	political pressure, fall in traffic, organizational change	yes	none	social pressure to increase employment; 1986-1989: market oriented	yes	1981-89: 0.6%

Table 2
Magnitude of Layoffs (Retrenchement)

Country	Transport Mode Enterprise	Extent of Labor Redundancy (%)	Number of Workers Laid Off	% of Initial Labor Force	Time Frame (no. Years)
BRAZIL	Railway (RFFSA) 1965-88		87,138	60%	23
CHILE	Ports (EMPORCHI) 1981	56%	1,961	56%	1
	Ports (Private Sector) 1981				1
	Railway 1975-79		13,000	50%	4
GHANA	Railway 1975-90		1,200	30% (1978-86) 15% (1987-90)	8 3
	Buses (STC) 1989-90		821	40%	2
	Buses (CES) 1989-90		884		1
	Ports 1985-89	50%	791 (1985-88) 1,793 (1989)	14% (1985-88) 36% (1989)	4 1
MAURITIUS	Ports 1980	66%	2,609	66%	1
SRI LANKA	Ports 1972		3,500	?	1
	Buses 1981-86		11,238	17%	4
	Buses 1990-91	39%	11,500	23%	1
YUGOSLAVIA	Railway 1969-86		none (some early retirement)		5-15
	Railway 1980-89	11%	"		2

Table 3
Dimensions of the Redundancy Schemes

Country	Transport Mode Enterprise	Who Involved in Decision & Design of Scheme	Voluntary (V) or Involuntary (I) Layoff	Early Retirement	Enforcement of Retirement age	Redeployment	Restrictions on Hiring	Training	Reduction in Restrictive Work Practices	Criteria for deciding who would be encouraged (or forced) to leave
BRAZIL	Railway (RPPSA) 1965-68	ministers and director of railway	V	yes	yes	yes	yes (1980's)	yes		maximize efficiency; enforced retirement of older workers and tested to weed out less productive
CHILE	Ports (EMPORCHI) 1981	ministerial team and director of EMPORCHI	I	yes	yes	no	yes	no	no	minimize social impact; older workers with pension were first
	Ports (Private) 1981	president's economic team (talks with union broken off)	I	no	no	no	yes	no	extensive	all those with registration cards
	Railway 1975-79	president's economic team and Director of Railways (EPE)	I & V	no	yes	no	yes	no	no	minimize costs to enterprise; no early retirement, only those eligible for normal retirement and then those with less than 15 years service
GHANA	Railway 1975-80	railway management, World Bank, Trade Union	V	yes	yes		yes	no		
	Buses (STC) 1989-90	IMAS, STC, management and trade union	I				yes	no		maximize efficiency, non-essential personnel -- laid off first, then those with poor performance records
	Buses (CES) 1989-90	IMAS, CES management and trade union	I		yes	no	yes	no		
	Ports 1985-89	management trade union, state enterprise commission ministry, World Bank	I	yes		no		no	some	maximize efficiency, layoffs across the board
MAURITIUS	Ports 1980	Tripartite Commission	I	-	-	no	no	no	some	all those handling sugar, if questioned middle-age men
SRI LANKA	Ports 1972	directors of PCHE	V					no		
	Buses 1981-86	ministers and directors of SLCTB	V		yes	no	no	no		no apparent criteria
	Buses 1990	government and World Bank	V		yes		no	no		ensure that remaining staff has appropriate skill distribution
YUGOSLAVIA	Railway 1969-86	railway management, workers & local authorities	V	no	no	yes	yes	yes		
	Railway 1980s	"	V	no	no	yes	yes	yes		all those made redundant by line closure

Table 4
Types and Amount of Compensation in the Redundancy Schemes

Country	Transport Mode (Enterprise)	Compensation Pay	Severance Pay	Loan Available	Pension (Min. % of salary)	Total Cost US\$	Cost per Laid- off Employee US\$
BRAZIL	Railway (RFFSA) 1965-88	employee's contribution to special fund	6 to 7 months per yr. of pre- 1965 service, during 1976-81; 6 months after 1982.	no	100% after 35 yrs. service (as of 1976)		
CHILE	Ports (EMPORCHI) 1981		6 months (in six installments) for those not eligible for pension	no	70-80%		
	Ports (Private Sector) 1981		10-30 months	no		\$30-70 million	Approx. \$12- 19,000 (to buy union rule book)
	Railway 1975-79	1 month/year of service	6 months	yes			
GHANA	Railway 1975-90	2-4 months of base pay per year of service		no		\$1.5 million (end of 1989)	
	Buses (STC) 1989-90	3-6 months of pay per year of service	1.5-3 months of pay per year of service	no			
	Buses (CES) 1989-90	Same as STC	Same as STC	no		\$510,000 (1989)	\$577
	Ports 1985-89	2.5-5 months of basic salary per year of service		no		\$3 million	\$1,887
MAURITIUS	Ports 1980		5 months of service	no	66% for those with 15+ years service		
SRI LANKA	Ports 1972	5 mo./yr. of past service (7.5 months = maximum)	n.a.	no		RS 2,887,500 in 1972 (maximum)	
	Buses 1981-86	5 mo./yr. of past service plus 1 mo./yr. of denied service (maximum = RS 20,000 or 24 months, whichever is less)	n.a.	no		RS 174.3 million in 1981	
	Buses 1990	5 mo./yr. of past service plus 1 mo./ yr. of denied service, (min = 6 mo's; max = actual denied salary)	n.a.	yes		\$80 million (est. total) (some to pay for buses)	\$4,000
YUGOSLAVIA	Railway 1969-86	Yes for early retired (varied by region and time.)		no			
	Railway 1980s	No if redeployed.		no			

Table 5
Benefits and Costs

Country	Transport Mode (Enterprise)	Redundancy Reduced?	Reoccurrence of Redundancy?	Improvement in efficiency of enterprise?	Improved Financial Performance of Enterprise?	Political Costs	Skill Shortages After Scheme?	Payback Period (Years) ¹
BRAZIL	Railway (RFFSA) 1965-88	yes	no	yes	yes	zero	yes	-
CHILE	Ports EMPORCHI 1981	yes	no	yes		low	no	-
	Ports (Private Sector) 1981	yes	no	yes		low	no	-
	Railway 1975-79	somewhat	no	yes		high	no	0.5-1.7
GHANA	Railway 1975-90	somewhat	no	yes	somewhat		some	1.1-3.2
	Buses (STC) 1989-90	somewhat	no	not much		zero		-
	Buses (CES) 1989-90	somewhat	no	some		low		-
	Ports 1985-89	significantly	no	yes	yes	?	no	1.6-4.7
MAURITIUS	Ports 1980	yes	no	yes		some	yes (not due to scheme)	0.3-1.3
SRI LANKA	Ports 1972	somewhat	no	yes		?	?	
	Buses 1981-86	no	yes	no			no	
	Buses 1990		should not	?		?	possibly	
YUGOSLAVIA	Railway 1969-86	yes	yes	not much		little	no	-
	Railway 1980s	somewhat; now estimated at 11%	yes	not much		little	no	-

¹ The calculations are based on equation (1) in text, with varying estimates of R and R^e.

Table 6
Financial Results

Country	Transport Mode Enterprise	Labor Cost as % Total Operating Costs		Working Ratio			
		Before	After	Before		After	
BRAZIL	Railway (RFPFA) 1965-88	36.5 (1970)	56.7 (1988)	1.6 ^a (1970)	1.4 ^b (1970)	1.1 ^a (1988)	1.0 ^b (1980)
CHILE	Ports (EMPORCHI) 1981	60.0 (1980)	30.0 ^c (1982)	1.0 (1980)		.8 (1981)	
	Railway 1975-79	n.a.	2.8 (1973)	1.5 ^d (1974)		1.1 ^d (1980)	
GHANA	Railway 1975-90	57.7 (1980-82)	68.0 (1987-89)	2.1-2.7 ^d (1980-82)		1.3-1.5 ^d (1987-89)	
	Buses (STC) 1989-90	36.1 (1986)	32.4 (1989)	1.1 ^d (1986)		1.3 ^d (1989)	
	Buses (CES) 1989-90	21.0 (1988)	17.2 (1989)	1.1 ^d (1988)		1.1 ^d (1989)	
	Ports 1985-89	66.4 (1985)	49.0 (1989)	0.9 ^d (1985)		0.5 ^d (1989)	
SRI LANKA	Ports 1972	n.a.	69.0 (1981)	n.a.		0.6 (1981)	
	Buses 1981-86	36.8 (1979)	34.7 (1985)	.9 (1979)		1.0 (1985)	
YUGOSLAVIA	Belgrade Railways	37.5 (1968)	40.2 (1989)	1.1 ^d (1968)		1.1 ^d (1989)	
	Ljubljana Railways	37.5 (1968)	45.5 (1989)	1.0 ^d (1968)		1.0 ^d (1989)	
	Sarajevo Railways	42.9 (1968)	33.9 (1989)	.9 ^d (1968)		1.3 ^d (1989)	
	Zagreb Railways	36.4 (1968)	60.3 (1989)	1.0 ^d (1968)		0.6 ^d (1989)	

n.a. = not available

a Without normalization.

b with normalization

c All reduction was in cost of manual workers in Chile (from 50% to 20%) not in "other staff" (which remained at 10% throughout).

d Operating ratio (includes depreciation)

Table 7
Productivity Indicators

Country	Transport Mode Enterprise	Railway TU/man year (000)		Bus Vehicle km per Bus Day		Employees Per Operating Bus	
		Before	After	Before	After	Before	After
BRAZIL	Railway (RFFSA) 1965-88	143.0 (1964)	598.2 (1984)				
CHILE	Railway 1975-79	185.2 (1974)	260.9 (1980)				
GHANA	Railway 1975-90	288.2 (1984)	662.2 (1989)				
	Buses (STC) 1989-90			522 (1987)	442 (1989)	32 (1987)	29 (1989)
	Buses (CES) 1989-90			n.a.	n.a.	26 (1987)	17 (1989)
SRI LANKA	Buses 1981-86			250 (1980)	217 (1987)	11.5 (1980)	10.5 (1987)
	Buses 1990-91			184 (1989)	?	13.1 (1989)	?
YUGOSLAVIA	Railway 1969-86						
	Belgrade	217 (1968)	290 (1989)				
	Ljubljana	240 (1968)	372 (1989)				
	Sarajevo	221 (1972)	357 (1989)				
	Zagreb	275 (1970)	323 (1988)				

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